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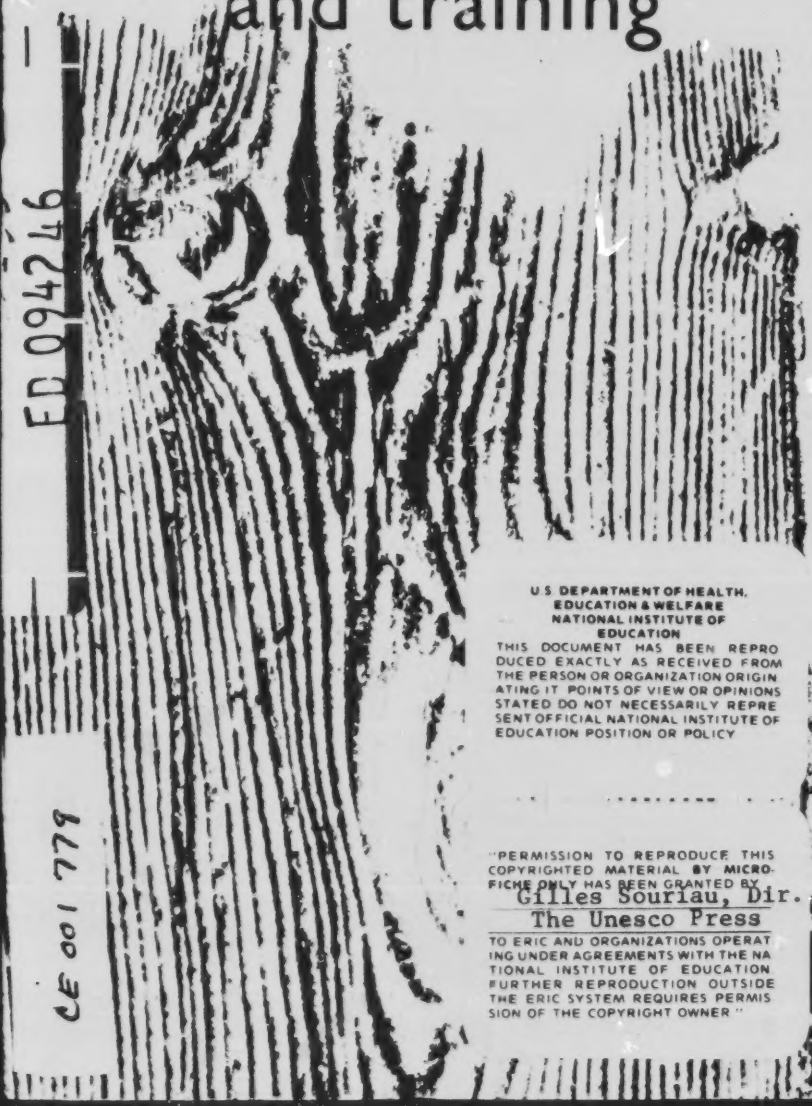
ABSTRACT

The publication provides information and analyzes certain problems in the education and training of technical and vocational teachers, and suggests various general guidelines for developing countries. The study reflects present trends and possible directions in these countries in two major areas: institutional structures and organization of programs and their content. Not intended as a descriptive reference work, the study takes a comparative approach within each topic considered, utilizing case studies of selected industrialized and developing countries selected by the quality of available documentation. A wide variety of programs, institutions, and curricula are examined; although no one system may be held up as a universal model, the survey provides ideas and models which may be adapted. Among conclusions drawn are these: (1) the present clear trend toward 4 years of postsecondary studies as a prerequisite for secondary teacher qualification is to be encouraged; (2) short pedagogical and inservice courses for those with technical qualifications can provide flexibility and variety in teacher qualification programs; (3) continuing education for teachers should be encouraged; and (4) efforts to raise the salaries and status of teachers must be made. (AJ)

technical and vocational teacher education and training



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PREFACE

In 1968, ILO and Unesco initiated a comprehensive study of technical and vocational teacher education and training. It was felt that the increasing recognition of vocational education to the whole development process justified a comparative international study of the various aspects of this particular genre of teacher preparation. The purpose of the present publication is two-fold: on the one hand, to provide information and to analyse certain problems in the education and training of these teachers and, on the other, to suggest various general guidelines. The study, written for teachers, teacher-educators, educational authorities and all others interested in the current and possible future state of such teacher education and training, is primarily intended for developing countries and therefore reflects present trends and possible directions which developments might take in these countries.

While research was not confined to any one geographical region, the number of countries considered in depth has been necessarily limited by such factors as space, data availability and the inherent interest of their experiences. The examples used and the comparisons drawn do not reflect value judgements and should not be interpreted as such.

Every effort has been made to provide the latest and most exact information. However, rapid changes in recent years render total accuracy impossible. In consequence, we would appreciate having any errors or changes brought to our attention.

Technical and Vocational Teacher Education and Training *is not the work of a single person or organization but rather the result of a co-operative effort co-ordinated by the Unesco Secretariat. It could not have been accomplished without the support of various National Commissions and member governments. Several individuals contributed to the preliminary work. Professors L. Baron (France) and V. A. Elizarov (Union of Soviet Socialist Republics) contributed papers on aspects of technical and vocational preparation in their respective countries. Dr W. Schulenburg, an ILO and Unesco consultant, prepared a preliminary general analysis. The initial questionnaire for gathering information was drawn up by ILO in co-operation*

with Unesco; ILO also contributed the whole of Chapter V. Dr Mary Ann Calkins Pilain, acting as consultant, co-ordinated the research effort in its later stages and was responsible for writing both the first draft and the final version based on comments received from the various countries concerned.

The views expressed in this book are those of the individuals concerned and do not necessarily reflect those of Unesco. The designations employed and the presentation of the material do not imply the expression of any opinion whatsoever on the part of the Unesco Secretariat concerning the legal status of any country or territory, or of its authorities, or concerning the delimitations of the frontiers of any country or territory.

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The society which scorns excellence in plumbing because plumbing is a humble activity and tolerates shoddiness in philosophy because it is an exalted activity will have neither good plumbing nor good philosophies. Neither its pipes nor its theories will hold water. (John Gardner.)

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CHAPTER I

INTRODUCTION: PRINCIPLES, TERMINOLOGY AND METHODOLOGY

No nation can afford to ignore the impact of technology on the modern world. Indeed, the rapid advances made in all technical and industrial fields in recent decades have determined the very contours of contemporary civilization. These changes require corresponding progress in technical and vocational education if technology is to be utilized to full advantage and utilized wisely for the betterment of man and not to his detriment. To scorn technical and vocational education as being of an inferior nature is to reject the realities of modern life and to refuse the opportunity to improve the quality thereof.

Among the necessary prerequisites for advance in vocational and technical education is the creation of a teaching corps dedicated to ideals of excellence. Vocational and technical teachers are responsible not only for inculcating knowledge and skills but, also, and most important, for preparing workers and technicians capable of contributing to a society which uses technology to serve the cause of humanity. In order that this be accomplished the technical and vocational teacher must then be first and foremost an educator.

The Unesco *Recommendation concerning Technical and Vocational Education*[1] states:

'Technical and vocational education should be an integral part of an over-all system of education and, as such, due consideration should be given to its cultural content. It should do more than train an individual for a given occupation by providing the persons concerned with the necessary skills and theoretical knowledge, it should also, in conjunction with general education, provide for the development of personality and character and foster the capacity for understanding, judgement, self-expression and adaptation to varying environments. To this end, the cultural content of technical and

1. *Recommendation concerning Technical and Vocational Education*, Articles 7–9. Recommendation adopted by the General Conference of Unesco at its twelfth session, Paris, 11 December 1962.

vocational education should be set at such a level that the inevitable specialization in technical and vocational education does not stifle broader interests.

'On the other hand, general education should not be limited to providing knowledge, but should also prepare every student for active participation in life by providing him with an understanding of the production and utilization of goods created with the help of technology and with a better comprehension of the world in which he lives.

'In view of the evolution of technology the need for an adequately broad background of general education before specialization at any level and continuous with it should be recognized.'

The preparation of teachers equipped to achieve these goals is an enormous task which will not easily be accomplished.

In its more practical aspects, vocational and technical education extends beyond the school years and into industry. For in terms of practical skills and techniques, the schools may give a basic foundation, but industry must train its recruits for the particular tasks required of them in their working life and engage in constant upgrading and updating of its personnel. Thus industry, too, has need of well-prepared training-personnel—instructors and training-officers—if the enterprise is to work to full efficiency and therefore contribute to the growth of the economy. Furthermore, vocational training in its entirety often devolves upon industry where school-leavers at an early age are hired with no previous vocational education or experience. The quality of the instructors and training-officers within industry will then have a direct effect on how well an individual is prepared for his working life, as well as on how much the industry contributes to economic development and growth for the general welfare.

The purpose of this study is to illustrate through description and analysis current trends and problems in the field of vocational and technical teacher education and training in industrialized and developing countries. General types of organization on the national level will be presented as well as typical training patterns for each category of technical and vocational teacher distinguished below.[1] Major problems encountered in technical and vocational teacher education will be discussed—recruitment, curriculum development, the status of teachers, teacher certification and planning for change and expansion. Guidelines as to possible solutions of certain difficulties will be proposed. The study, then, is intended to inform

1. See pages 17–19.

teachers, teacher-educators, members of governments responsible for technical and vocational teacher education and other interested persons. It is further intended to serve as a guide to those countries in the process of development which are instituting programmes to prepare technical and vocational teachers and training-staff in industry, or which are planning to do so.

PRINCIPLES AND GOALS OF TECHNICAL AND VOCATIONAL EDUCATION AND TEACHER PREPARATION

If any form of education is to have a vital content, it must be sustained by principles incorporating its goals and ideals and relating them to higher aspirations. Vocational and technical education is no exception. In the past, this type of education has often been seen not as education in the true sense of the word, but rather as a type of practical training preparing people for specific occupational tasks. Training is certainly a part of vocational and technical education but it must be in conjunction with an education in how skills and technology are related to the individual's and society's needs and aspirations. Humanism must be combined with training if vocational and technical education is to have meaning.

From the inception of the industrial age observers and commentators subscribing to varied social and political philosophies have feared the dehumanizing effects of mass industrial civilization. Marx analysed the alienation of man brought on by the machine age. The Frenchman, de Tocqueville; the Swiss, Jakob Burckhardt; the American, Henry Adams; all regarded the civilization of the nineteenth century with horror and had dire forebodings for the twentieth. Still, advancing technology has often served to better the material condition of mankind and has therefore offered opportunity for improvement of his spiritual condition. If a man is hungry, he has little time for speculation on how the world might be made a better place. On the other hand, some portion of the warnings of critics, past and present, of technological civilization must be heeded if man is to control his contemporary environment. The gap, distinguished by the British writer C. P. Snow, between the two cultures, between the scientific and technical community on the one hand and the humanistic on the other, must be closed. It is the greatest challenge to and the greatest opportunity for vocational and technical education at the present time.

Vocational and technical education, as indeed all education,

should serve both individual and social needs. Every individual has the right to an education so that he may develop his personality and talents to the highest extent of his ability.[1] Many individuals have missed this opportunity because vocational and technical education was either non-existent or limited, or because it was considered inferior. Society has suffered as well. The lack of properly educated individuals has retarded economic and social progress and has often served to widen the gap between technology and humanism. It is, then, in the interest of both individuals and modern societies to develop vocational and technical education with the highest goals in mind.

The quality of vocational and technical education depends upon the teachers, teacher-educators and administrators responsible. The teacher should see himself as a member of a professional body devoted to the pursuit of excellence. He should not only subscribe to the educational ideals proposed by his society, but should also in the course of his preparation and career develop his own educational philosophy. The technical and vocational teacher occupies a most important place in modern society: he is the link between industrial society—the 'real' world—and the educational system. He is uniquely placed for contributing to the goals of binding humanism and technology. He must, then, possess a thorough knowledge of his field and have had some experience in the world for which he is preparing his students. He must understand his students as individuals, knowing how they learn best and how he may best transmit his own skills and knowledge in order that they be educated and not simply trained. He must wish to pursue his own studies, both technical and pedagogical, throughout his career, and to see the process of learning as a lifelong one. A teaching career is, then, a vocation in the sense of a calling, as expressed in the following citation from the Russian scientist Mendeleyeiv:[2] 'People should be called to teaching as they are called to the seas, to medicine, and so on, not just because they want to make a living, but because they have a conscious vocation for it and for knowledge, and feel they will find satisfaction in understanding the national need.'

The initial preparation of a teacher is fundamental if he is to fulfil these tasks and goals. In the past, formal professional studies were not considered necessary for technical or vocational teachers; tech-

1. Unesco, *Convention against Discrimination in Education*, adopted by the General Conference of Unesco at its eleventh session, Paris, 14 December 1960.
2. Cited in the U.S.S.R. reply to the Unesco/ILO questionnaire on the training of technical and vocational teachers, 1962, hereafter referred to as 'Unesco/ILO questionnaire'.

nical qualifications alone sufficed. It is now recognized that although some persons may be born teachers, they are few in number. The vast majority need special preparation for the exercise of their profession, as for any other profession, and technical and vocational teachers are no exception.

In the course of the following study it will become patently clear that there is no one ideal system of teacher preparation for the fulfilment of these goals. Each country, each society, must organize its educational system according to its own needs, aspirations and traditions. Nevertheless, there are general trends, patterns and goals to which virtually all subscribe.[1] It is generally agreed, for example, that vocational and technical teachers of whatever type should be prepared at the tertiary level, the length and content of the course depending upon both the future role and previous education and training of the teacher. It is further agreed that all should have had a good general education, theoretical training in the special field and practical experience in exercising this specialty. Then, too, the current trend is to recognize the necessity of pedagogical studies, both general and special, as well as a guided practical teaching experience if the individual is to be a good teacher. The ways of accomplishing these goals are numerous and should remain so. Flexibility should be the keynote in vocational and technical teacher education if the quality and quantity of teaching personnel, necessary to any given country, is to be obtained. Therefore, a number of ways of achieving teacher qualification should be made available so that at any point in his working life a dedicated individual may enter the teaching profession.

Few areas are more vital to nations in the process of development than technical and vocational education. The educational systems in most developing regions are the legacy of colonial times and are not necessarily suited to either the traditions or future needs of the countries. These countries are now engaged in the enormous task of changing and expanding their educational systems to meet the new requirements. The obstacles are many—among them attitudes, lack of funds and experience in the field, and few facilities for long-range planning. Yet these obstacles must and can be overcome if economic and social development is to proceed at the desired pace. As Professor A. B. Fafunwa, Dean of the Faculty of Education at the University of Ife, said in a speech given at the third graduation

1. Unesco, *Recommendation concerning the Status of Teachers*, adopted by the Special Intergovernmental Conference on the Status of Teachers, Paris, 5 October 1966.

ceremony at the National Technical Teachers College in Yaba, Nigeria, in 1970: 'It is crystal clear that African reconstruction, rebirth, development, or call it what you will, can become a reality when and only when Africa is prepared to place greater premium on technical education. . . . The training and procurement of teachers must precede all other considerations; the development of any educational level presupposes the availability of teachers in sufficient numbers to man the institutions.'

Certainly Professor Fafunwa's statement is applicable to all developing countries.

Perhaps the most fundamental barrier to the development of technical education in a number of developing countries, as has equally been the case in many developed countries, is a negative attitude on the part of many to this type of education. Manual and technical work has been traditionally seen as being of a lower order and suitable only for the uneducated. As a result a situation exists in many countries whereby a large percentage of those completing secondary education and even university graduates are unemployed because there are not enough office jobs to go round. This is a tremendous waste of human resources. Obviously attitudes cannot be changed overnight, but with technical education as an integral part of the educational system and with the circulation of information as to the opportunities offered by a technical and/or vocational education the change will come more rapidly. And the better the teachers the more attractive technical and vocational education will become.

As will be seen in the course of this study, numerous programmes for the preparation of technical and vocational teachers and training staff are now instituted or in the process of being established in a number of developing regions. There is, then, ample evidence of the growing recognition of the necessity of such programmes. Numerous facilities for funding and technical assistance exist to enable developing countries to establish and carry out such programmes. Several Specialized Agencies of the United Nations—the International Labour Office, Unesco, and Unicef for example—are engaged in projects for the preparation of technical and vocational teachers of all types. The International Bank for Reconstruction and Development (IBRD) has shown great interest in financing such projects and the International Development Association (IDA) has provided funds for long-term development efforts which include the expansion of technical and vocational education and teacher training. Bilateral aid agreements are another way developing countries may obtain the necessary funds and experts. There are also many regional associations such as the Colombo Plan

through which aid may be had. These are but a few examples of the agencies and organizations carrying out research and projects in this field.

Technical and vocational education and training is a prerequisite for development. But if educational reform is to be carried out effectively, the reform must be in accord with a long-range educational strategy. No reform will succeed without a policy establishing goals and planning to achieve them. The importance of an educational strategy cannot be overestimated. For example, widespread curriculum reform in the schools to introduce technical and vocational education will be useless unless the reform can be implemented—that is, unless qualified teachers are prepared. The establishment of programmes for vocational and technical teacher education must, then, be seen as a necessary part of a strategy for education which will lead to development.

TERMINOLOGY

The lack of an internationally accepted terminology poses a barrier to communication, and therefore to understanding in the field of vocational and technical education and teacher preparation. The establishment of such a terminology is a difficult and delicate task, complicated as it is by differences in language and educational concepts, structures and traditions. An attempt has been made in this study to use a terminology which is conceived as an instrument of international communication and does not necessarily reflect the terms and concepts of any particular national community.

For the purposes of the present study the following terminology is used.

General technical education: a programme of education which is a part of the general education offered in schools on the lower secondary level and is designed to introduce students to the elements of technology and basic practical technical skills. These programmes are offered for exploratory and guidance purposes rather than to prepare students for any specific occupation. Thus general technical education serves to enlarge the general education of all students, to orient some toward further technical or vocational education, and to provide early school-leavers with some rudiments of technological understanding which will enable them to be more easily trained on the job. The programme content will depend upon which of the above three functions is emphasized. Other terms used for this type of education include: elementary technology, industrial arts, polytechnical, and pre-vocational.

Vocational education: education designed to prepare skilled workers for industry, agriculture, commerce, etc., which is usually provided on the upper secondary level. Programmes of vocational education include general studies, practical training for the development of skills required by the chosen occupation and related theory. The proportions of these components may vary considerably but the emphasis is usually on practical training. These programmes may be full-time in schools or other educational institutions or part-time as supplementary education for apprentices or others receiving their practical training in employment.

Technical education: education designed to prepare technicians for industry, agriculture, commerce, home economics, medicine, etc., which is usually provided at the upper secondary or lower tertiary level. The curricula of technical education include general education, general technical theory, training in special technical procedure and skills, and related theory. These components may vary considerably depending on the type of technicians to be trained and the level at which these programmes are offered.

Teacher education or preparation: a programme of pedagogical studies, both theoretical and practical, leading to qualified membership in the teaching profession. Teacher education may be given in conjunction with studies in a special subject area or may be the content of a professional programme taken separately. Teacher preparation for secondary and higher education takes place at the tertiary level, the length and content of programmes dependent upon the subject and level at which the teacher will eventually teach, and upon his qualifications at entry into the programme.

General technical teacher: a person teaching the theoretical and practical aspects of elementary technical subjects usually at the lower secondary level.

Vocational teacher: a person teaching theoretical subjects and/or the theoretical aspects of practical training courses in secondary educational institutions in which skilled workers are educated and trained for occupations in the trades, crafts, industry, agriculture and/or commerce. In some countries, the vocational teacher is responsible for practical workshop training as well.

Workshop teacher: a person teaching the practical skills required by technicians and skilled workers in school workshops, usually on the upper secondary level, but also in the first cycle of secondary education or on the post-secondary level. Normally, the technical or vocational teacher to whose courses the practical training activities relate co-ordinates the work of the workshop teacher.

Technical teacher: a person teaching general and special technical

theory in educational institutions on the upper secondary or post-secondary level the aim of which is to educate and train technicians. Usually the technical teacher is responsible for both classroom and laboratory work, but may also supervise practical workshop training to the extent required in order to integrate the theoretical and practical aspects of technical education. He may be assisted in laboratory work by appropriately qualified laboratory technicians.

Training officer, training director: a person employed by an undertaking (or group of undertakings) with the main functions of supervising, organizing and/or planning training carried out within the undertaking(s) as well as arrangements made for training given outside for the staff of the undertaking(s). Depending on the size of the undertaking or group of undertakings and the volume of training activity, the training-officer or training-director may be concerned with training for all levels of staff or for one or two levels only. He may give some or all of the courses himself and may supervise the work of specialized instructors and other training-staff.

Instructor: a person performing the same function as the workshop teacher but employed in training centres, training workshops, or in industrial or commercial enterprises.

The foregoing terminology is certainly open to question, but it would appear to be flexible enough to be used in comparing various technical and vocational teacher education systems and institutions. Hopefully, one of the by-products of this study will be to stimulate further consideration of the problem.

METHODOLOGY

RESEARCH AND DOCUMENTATION

For the most part, this study has been documented from reports, working papers and special documents to be found in the Technical Education Section of Unesco. The major source among these was a series of replies to a detailed questionnaire drawn up by ILO and Unesco and sent to selected Member States in 1968. In 1971, when a draft version of this study was completed, it was considered highly probable that much of this material was outdated. The draft with a questionnaire was therefore sent to the various countries for comment and to elicit more up-to-date documentation.[1] The

1. Information received from this questionnaire and from other comments will be noted hereafter as 'reply to questionnaire on draft'.

differences, often radical, in the 1968 replies and the 1971 replies serve to illustrate the rapid changes and reforms taking place in technical and vocational teacher preparation in even the most industrialized countries. The documentation as a whole was uneven in quality and thus certain topics and certain countries were often not dealt with in as thorough a fashion as desirable.

There is a relative lack of good recent published material in the field of technical and vocational teacher education when compared with the number of publications in other education fields. As will be seen from the footnotes and bibliography in this study, there are a number of works concerning technical and vocational education in general and in specific countries. Works concerning technical and vocational teacher preparation are, on the other hand, rare, and comparative studies even more rare.[1] If the present study serves even in a small way to fill this lacuna and to stimulate further research and publication in the field of technical and vocational teacher preparation it will have largely served its purposes.

A COMPARATIVE APPROACH

This study is not intended as a descriptive work of reference as to the current state of technical and vocational teacher preparation in selected countries. Rather, in order to analyse current trends and problems, especially as they might interest developing countries, a comparative approach has been taken within each topic considered. Thus an analysis of general types of technical and vocational teacher preparation is followed by an analysis of each category of technical and vocational teacher and trainer within industry, as distinguished in the terminology used in this study. Each of these topics has been further divided into a consideration of selected industrialized countries followed by a consideration of selected developing countries. It should be noted that very often the quality of the documentation available determined the choice of country for a particular case study. A chapter is devoted to specific problems in the field with particular reference to the needs of developing countries. The case study method has been used in order to illustrate either typical approaches to technical and vocational teacher preparation or approaches which might be of particular interest to developing countries. These cases are then compared within each particular topic under consideration, and conclusions drawn.

1. One exception to this statement is a recent publication: L. Geminard, *Formation des Professeurs des Enseignements Techniques et Professionels en Europe*, Paris, SEVPEN, 1971, 247 pp.

In order to facilitate comparison of the wide variety of systems and institutions and to orient the reader, an educational structure model has been devised. From this model, which constitutes Appendix I.1, one may see the levels at which various types of technical and vocational education are given, the type of employment to which this education leads, and the category of teacher employed in each branch of technical and vocational education. Attached to the educational structure model as Appendix I.2 is an institutional patterns model for technical and vocational teacher education which indicates general programme patterns as well. These two models should be referred to throughout the study. As in the case of the terminology these structures and patterns do not necessarily correspond to any one national system. They are rather generalized schema conceived as a practical means of communication: by comparing the structure obtaining in two or more countries with them one may compare the countries themselves.

Obviously the differences among educational systems render a study of this sort subject to error. The establishment of international equivalencies for comparative and analytical purposes in terms of degrees, diplomas, certificates, etc., and in terms of levels of education is a difficult task and one which has yet to be accomplished. It is hoped that the method used in this study, though certainly not perfect nor, undoubtedly, acceptable to all, will lead to accurate comparisons and therefore to valid conclusions.

LIMITS IN SCOPE

This study cannot pretend to be exhaustive. On the one hand, not all relevant topics are covered in depth. On the other, the study is not designed to be a reference catalogue of systems of technical and vocational teacher education. Therefore, many countries with excellent programmes are mentioned only briefly or not at all referred to.

To be truly comprehensive this study would have considered more fully two areas which are dealt with rather superficially. More space would have been devoted to a discussion of the general education systems of the various countries, for if teacher education is to be dealt with in a thorough fashion, it must be discussed in a larger context. Also, the study is focused on the preparation of teachers of industrial and technical subjects, that is, the teachers of future skilled workers and technicians in industry. Commercial and agricultural teacher preparation, to state but two other examples of fields within the compass of vocational and technical teacher

education, are mentioned only in several very specific cases. These two omissions are intentional, though perhaps not fully justified. To have dealt properly with all these areas would have so extended the scope of the study as to make it unwieldy and perhaps less useful.

CHAPTER II

GENERAL PATTERNS IN TECHNICAL AND VOCATIONAL TEACHER EDUCATION

As stated in Chapter I, the fundamental components of technical and vocational teacher education are: a sound general education; theoretical and practical studies in the special field; employment experience in the special field; and pedagogical studies and supervised practice teaching. Few countries possess structures of technical and vocational teacher education which provide optimum preparation in terms of all these components for all types of technical and vocational teachers. This is hardly surprising when one considers that this type of teacher preparation on a systematic basis is a relatively recent phenomenon, and also the complexity of the factors governing the establishment, maintenance and expansion of a comprehensive system. It is clear, however, that many countries, both industrialized and developing, have either now or in the recent past, recognized the urgent need either for extending, strengthening or re-organizing existing systems or for creating new institutions in order to provide the required number of qualified teachers.

Over-all systems of technical and vocational teacher education as well as the type of institutions which offer one or more of the components are as numerous and varied as the countries in which they exist. General patterns, both on the national and the institutional levels may, however, be distinguished. An analysis of these patterns and of certain organizational trends in developing countries, by establishing a general context, should facilitate the comparison in later chapters of the form and content of programmes for each of the four categories of teacher previously defined, i.e. the general technical teacher, the vocational teacher, the workshop teacher and the technical teacher.

On the national level, two major patterns of organization which correspond to the organization of the educational system as a whole

may be delineated: the centralized and the decentralized. On the institutional level three general patterns emerge:

Pattern 1. General universities or other tertiary general institutions.
Pattern 2. Technical universities or other tertiary technical institutions.
Pattern 3. Special institutions designed exclusively for technical and vocational teacher preparation.

These patterns are illustrated in the model to be found in Appendix I.2. In-service courses leading to initial teacher qualification (as distinguished from those designed to update or upgrade knowledge) form a pattern apart. The three patterns of institutional organization and the in-service pattern may all exist concurrently in one country; indeed more often than not in-service courses are directed by one of these three types of institution.

One other form of teacher training should be mentioned though it will be analysed separately: the preparation of vocational instructors and training-officers by industry itself. These instructors, either skilled workers or technicians, and training-officers are recruited on the basis of the quality of their work and their aptitude for leadership. The programmes for instructors, usually relatively brief, include both technological upgrading and pedagogical training, but are conducted outside the educational system, under the aegis of the industry itself or in co-operation with government authorities concerned with industry. Programmes for training-officers usually are conducted by the same means but on occasion in co-operation with a technical school or university.

FACTORS DETERMINING VARIATION

The major factors determining variation among systems of technical and vocational teacher preparation should be mentioned in order that the typical patterns distinguished below may be kept in proper perspective. Although many factors may be isolated, seven appear to be of primary importance:

1. The degree of a country's technical development and the technical potential of its natural resources.
2. The national economy.
3. The type of responsible authority.
4. The historical development of the education system as a whole.
5. The nature of the relation between schools and industry.

6. The prevailing conception of the function of technical and vocational teachers.
7. National legislation concerning the status and salary scales of teaching and administrative staff in technical and vocational education.

The degree of a country's technical development and the technical potential of its natural environment will determine the number and kinds of technical personnel to be educated and trained. The stage of technical development will then have an influence on the number and type of technical and vocational teachers to be prepared. A highly industrialized country will have far more need of technical and vocational teachers on all levels than a developing one and therefore will have an educational system designed to provide them. In this respect, developing countries often find themselves trapped in a vicious circle. Technical development or the exploitation of the technical potential of the national environment requires trained personnel, and teachers to train them. But if the degree of technical development is low then there will be neither teachers nor trained personnel. The only way out is to attack the problem on two fronts by creating concurrently both educational facilities and the facilities necessary for technical development.

It is evident that the nature of the national economy has a direct bearing on what kind of teachers are required to educate people who will either sustain that economy and the society on which it rests, or contribute to desirable change. An economy which has a primarily industrial base will have need of trained industrial manpower and thus the technical and vocational educational system and the teachers therein will be geared to industry, and more or less emphasis will be given to the agricultural, commercial and service sectors. If it becomes long-range national policy to exploit more fully another sector of the economy, then the content of teacher education will take on new dimensions accordingly.

The type of authority responsible is a third factor determining variation among systems of technical and vocational teacher education. Where a national ministry is responsible for vocational and technical education and teacher preparation, either the existing or the projected system is likely to be more structured and better organized in relation to over-all national policy. Generally accepted standards for recruitment and training may more easily be imposed and maintained. When local authorities and/or autonomous institutions are responsible, the system is usually more flexible and more easily adapted to rapid change. If the responsible authority is

a ministry of education, a local education authority, or an educational institution, the nature of the instruction given future teachers tends to be theoretical, with greater emphasis placed on pedagogical studies, both theoretical and practical. Where a ministry of labour or an enterprise is responsible for the preparation of teachers, the instruction is more functional and related closely to well-defined occupational specialties.

The historical development of educational systems in terms of traditions and structure exercises considerable influence on vocational and technical teacher education. In the past, in virtually all countries education has been defined as academic in nature and the schools and curricula organized accordingly. The phrase 'technical and vocational education' was seen as a contradiction in terms. Where this academic tradition has been the strongest, there has been the greatest difficulty in incorporating technical and vocational teacher education into the general structure of teacher preparation. As a result of historical development, the status of vocational and technical teachers has been beneath that of the teacher of academic subjects. Often also the training of such teachers has been outside the educational establishment, usually in industry. The lengthening of compulsory education, however, has required more flexibility in the school systems to take care of the needs of all types of students, particularly those whose interests are non-academic, and thus a greater emphasis on the preparation of vocational and technical teachers.

The fifth factor mentioned above—the relationship between educational institutions and industry and other economic sectors—affects vocational and technical teacher education in several ways. Where close liaison exists, technical and vocational teachers will more likely have employment experience and the education and training aspects of teacher preparation will be better conducted. The desirable co-operation between teacher preparation institutions and industry is extremely difficult to organize, however, and few countries have adequate provision for this aspect of technical teacher training. In some countries, teachers may not be required to have employment experience either because it is not considered necessary or it is not possible given the degree of technical development. In the second case a large proportion of the teacher preparation programme might be devoted to practical training. In other countries teachers are required to have had practical experience before entering the teacher preparation programme. In this case programmes are usually directed to pedagogical studies and might include further technical theory.

The prevailing conception of the function of technical and vocational teachers will determine both the extent of provision made for their professional preparation and its nature. Where technical and vocational teachers are expected to function in a broader educational context rather than simply transmitting skills, there is likely to be a greater degree of provision made for their preparation and they are more likely to be better integrated into the teaching profession as a whole. Also, this preparation is more likely to include a certain emphasis on the pedagogical component. It should be noted in this context that technical and vocational teachers of commercial subjects are more often seen in this light, for commercial studies, by their very nature, are more closely associated with general studies and therefore have been in most countries the first branch of technical and vocational education to gain widespread acceptance on an academic plane. Accordingly, more provision has been made for the preparation of commercial teachers and they have faced fewer obstacles in gaining equal status in the teaching profession than their colleagues teaching industrial or agricultural subjects. Where the function of technical and vocational teachers is considered as primarily practical in nature, emphasis will be placed on practical skills and employment experience, and relatively little formal preparation for the teaching profession will be required. Furthermore, the functions of various categories of technical and vocational teachers may be differently conceived and therefore there may be variations within one country in the extent of provision for any one category. For example, in some countries technical teachers function primarily as teachers of theory and therefore academic qualifications assume primary importance with little or no pedagogical preparation required. Within these same countries, pedagogical qualifications may be required for other categories and therefore appropriate facilities will be available. The prevailing conception will also determine whether special provision will be made for each type of teacher or whether two or more categories will receive the same pedagogical preparation. In some countries categories of technical and vocational teachers are not sharply delineated and therefore their functions not differentiated. In this case two or more types of teacher may receive the same pedagogical preparation.

National legislation concerning the status and salary scales of teaching and administrative staff in technical and vocational education is a factor of primary importance not only determining variations in systems of teacher education but also their quality. For where national legislation places technical and vocational

teachers on the same footing as other members of the teaching profession, more highly qualified people will be attracted. Equality of status, salary and advancement opportunities is essential if the educational system is to vie successfully with industry and other sectors for competent people. It is evident that where competent people are attracted to teacher education programmes, the level of these programmes will be raised. Furthermore, where the teaching profession is made more attractive, more people will be drawn to it and therefore wider provision will exist for teacher preparation.

NATIONAL PATTERNS

The two general patterns of organization of technical and vocational teacher education on the national level, the centralized and the decentralized, are closely related to the structure of the educational system as a whole which in turn is dependent on the structure of public authority. Each pattern has its advantages and disadvantages as a model and each in its own way may provide guidance in terms of long-range organizational goals to those countries in the beginning stages of establishing a system of technical and vocational teacher education. These patterns will only have value as models, however, in so far as they are changed and adapted wisely to the cultural traditions and educational goals prevailing in a developing country.

CENTRALIZED PATTERN

The centralized pattern of technical and vocational teacher education is to be found in countries with a centralized structure of public education. As technical and vocational education was incorporated into the public education system, institutions were established to prepare teachers for these posts.

Usually this type of system is composed of a series of specialized institutions (Pattern 3) since types of teachers, their functions and, consequently, the requirements for their preparation, tend to be clearly defined. Thus, each institution or type of institution within the system serves a very specific function in that it, or they, will prepare one specific type of technical or vocational teacher.

In the centralized pattern, national standards for the technical and vocational teaching corps may be more easily established and maintained. Entrance into the teacher preparation institutions is determined according to the results of a national examination.

Furthermore, career and promotion patterns are stable and well-defined. For, having followed a prescribed educational pattern, an individual may be fairly sure of the type of institution in which he will teach, and the path his career will follow.

France[1]

In France the entire system of public education is highly compartmentalized. Technical and vocational teacher education, as part of this system, is dependent on the Ministry of National Education, the sole responsible authority. A series of institutions has been created to prepare teachers for the various levels of vocational and technical secondary and post-secondary education. Fig. 1 (overleaf) showing the structure of the French system of technical and vocational teacher education serves as a prelude to a more detailed discussion. As may be seen from a comparison of this diagram with the general structure model in Appendix I.1, all technical and vocational teacher education is given on the tertiary level.[2] A comparison with the institutional patterns model (Appendix I.2) shows that technical and vocational teacher education takes place in specialized institutions (Pattern 3).

Just as technical secondary and post-secondary institutions for the education of technicians are at present strictly separated from institutions for the education of skilled workers, teachers for technical education are prepared in institutions separate from those for teachers in vocational education. At the top of the structure is the École Normale Supérieure de l'Enseignement Technique (ENSET) which prepares technical theory teachers and researchers at several university grades for a number of advanced secondary and tertiary technical institutions. Workshop teachers for the technical *lycées* are trained in separate institutions, four in number, called Centres de Formation de Professeurs Techniques Adjoints (CFPTA). Vocational teachers and workshop teachers for vocational education are prepared in separate courses in the six Écoles Normales Nationales de l'Enseignement Professionnel (ENNEP).

In France the teacher of theoretical technical disciplines in technical *lycées* is roughly equivalent to the technical teacher as

1. France, reply to Unesco/ILO questionnaire; and paper forming France's reply to questionnaire on draft.
2. The exception for the present time is the section in the ENNEP's for *professeurs techniques adjoints* (workshop teachers) for the *collèges d'enseignement techniques* (vocational schools). Since candidates for entry usually have not completed full secondary education, the academic level is rather upper secondary. This will change in the future however.

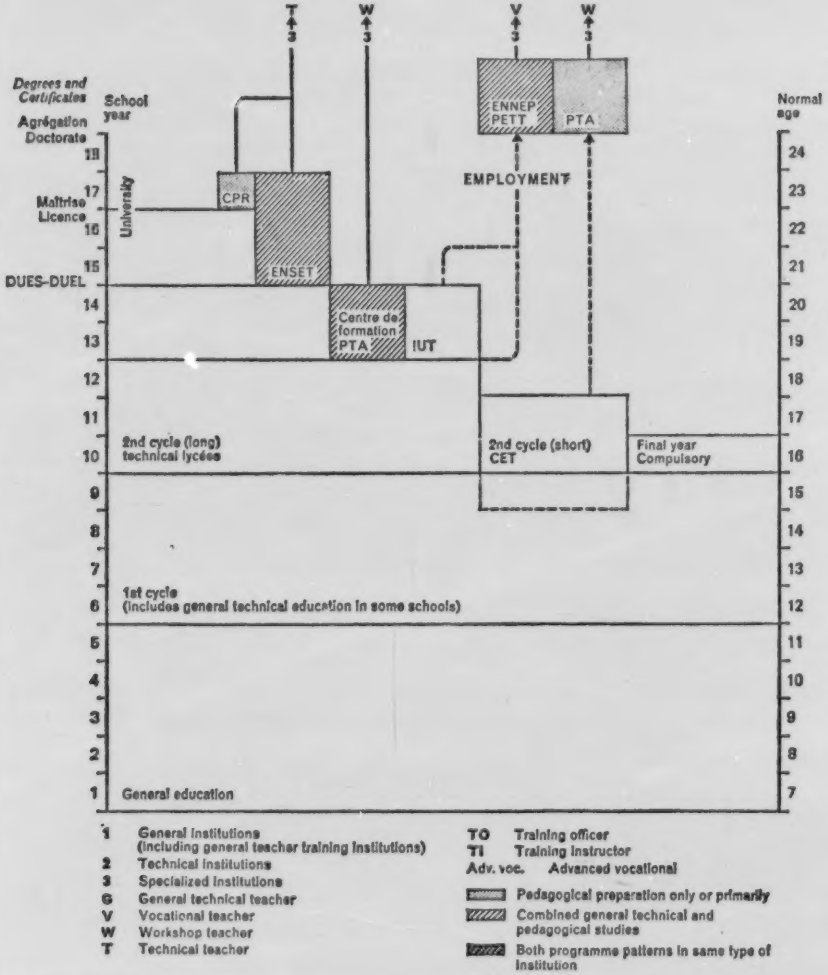


FIG. 1. France: Educational structure. (For explanation of abbreviations please see text.)

defined in this paper. This category of teacher must have a complete university education which lasts approximately five years after completion of the second cycle of secondary education (level of the *baccalauréat*). These teachers, as in the case for teachers of general subjects in technical *lycées*, may be prepared in one of several university faculties, with an additional year in a regional pedagogical centre, but many are also prepared at ENSET in certain special departments for mechanics, construction and economics.[1] Whichever way is chosen, all must receive the *certificat d'aptitude à l'enseignement technique* (CAPET) before they may compete for a teaching post.

The special departments within ENSET are, then, designed to prepare teachers and researchers for technical education institutions.[2] Entrance is determined by success on an examination taken after two years of study on the post-secondary level either in a university faculty or in one of the very good technical *lycées* which offer studies at this level. These studies are sanctioned by a diploma, DUES or DUEL (*Diplôme Universitaire d'Etudes Scientifiques* or *Diplôme Universitaire d'Etudes Littéraires*). At ENSET, future teachers of technical theory are enrolled in either the mechanical construction section or the building construction section. These studies, which include technical and pedagogical subjects, last two years, at the end of which the equivalent of the degree of *maîtrise* is obtained, and students take the theoretical part of the CAPET examination. Between the second and third academic years students work for a brief period in industry. In the third year of studies students spend a lengthy period teaching in the technical *lycées* under the supervision of an experienced teacher and begin preparation for the *agrégation*.[3] At the end of the third year, students sit the practical examination for the CAPET. Those who are capable of so doing may continue their special studies to the level of the *agrégation* which is roughly equivalent in level to a doctoral degree, a programme which takes from four to five years after completion of the DUES or DUEL.

1. Section B1. (Construction—Industries Mécaniques); Section B2. (Construction—Industries du Batiment); Section D. (Sciences et Techniques Économiques).
2. In addition to technical theory teachers, maths and science teachers, social science and language teachers, home economics and commercial economics teachers have been trained at ENSET—all destined to teach in technical or commercial *lycées*. This is now changing for all but commercial teachers, as ENSET is now concentrating on programmes which lead to the *agrégation* and thus preparing rese[illegible]ers rather than emphasizing teacher preparation for secondary educati[illegible]
3. It should be noted that the *agrégation* is awarded upon the basis of a competitive examination rather than upon the basis of a thesis as is the case for the doctorate.

Those obtaining the *agrégation* are qualified to teach in tertiary institutions.

Workshop teachers for the technical *lycées* are trained in one-year courses (old régime) or in two-year courses (new régime) given in the four Centres de Formation de Professeurs Techniques Adjoints at Cachan, Rennes, St Étienne and Armentières. Candidates for the one-year course must have a *brevet* of technician or higher technician and five years of industrial experience. Candidates for the two-year course must have at least the *baccalauréat sciences-technologie* or the *baccalauréat de technician*, and those with two years of post-secondary technical studies or the *brevet* of higher technician are preferred. Also in special cases the *brevet* of technician is accepted and workshop teachers in the *collèges d'enseignement technique* (CET) may apply. Entrance to all is determined by examination. After completion of the programme, which includes technical, scientific and some general studies as well as pedagogical preparation adapted to the needs of workshop teachers, students take an examination leading to the *certificat d'aptitude à la fonction des professeurs techniques adjoints* (CAPTA). In the future it is envisaged that all courses in the centres will last two years, one year being devoted to work in industry and the other to pedagogical studies.[1] With this reform students will be recruited from those with either a *brevet* of higher technician or a university diploma of technology (two years' post-secondary studies) and is intended directly to make up for the lacuna of practical experience under the new régime.

Professeurs d'enseignement technique théorique (PETT), which correspond to vocational teachers as defined in this study, teach theory in the vocational schools (CET). Those responsible for workshop training in these institutions are called *professeurs techniques adjoints* (PTA) or *professeurs d'enseignement professionnel* (PTEP).[2] Both types of teacher, as well as the teachers of general subjects (PEG) in the CET, are prepared in the six Écoles Normales Nationales d'Apprentissage (ENNA). Patterns of recruitment and programmes differ, however, for future PEGs, PETTs and PTEPs (PTAs). Future PETTs are recruited from diploma engineers (although this is rare), from higher technicians with two years' post-secondary education (which is a source of increasing importance), from those who hold either the *baccalauréat* or the *brevet* of technician, or from experienced PTEPs. Future PTEPs are recruited from experienced workers and

1. Geminard, op. cit., p. 86.
2. Although the title PTA is the same for workshop teachers in both the technical *lycées* and the CETs, this is a mark of administrative status, rather than an indication of equivalence of academic qualification.

technicians. For the programme all candidates must have had at least five years' employment experience in industry, commerce or teaching. Entrance to the ENNA is obtained through competitive examination. The one-year programme for PETTs includes some general subjects, further technical theory and practice, pedagogical studies and a period of practical teaching in a CET attached to the school. A reform which would extend all programmes to two years, with the further 'academic' studies emphasized in the first year (which will also include work periods in industry and some pedagogical initiation), is now under consideration. These studies are sanctioned by a *certificat d'aptitude à l'enseignement dans les collèges techniques* (CAECET) after one year of successful probationary teaching. Future PTEPs are recruited from the ranks of experienced workers; at present no academic qualifications are required. The course lasts eight months and is centred around pedagogical studies appropriate for the teaching of practical subjects.

The above summary of technical and vocational teacher preparation in France demonstrates the rationally organized and at the same time compartmentalized nature of the French system. There are specialized institutions and programmes for each category of technical and vocational teacher. Once a candidate is admitted into any of the institutions and successfully completes the course of study and passes the appropriate examinations he is virtually assured of a post. Furthermore once students are committed to teaching in the final year of pedagogical studies they draw a salary only slightly lower than that of a beginning teacher. The system of national examinations for entry into teacher preparation programmes, for obtaining a diploma, and for obtaining posts and promotions, assures that uniform standards are maintained. The fact that the French system has undergone a number of changes over the last few years and that more are planned illustrates the importance even the most highly industrialized countries are attaching to improvement in technical and vocational education and teacher preparation. For example, reforms are foreseen in order to alleviate the problem of too wide a difference between technical and vocational teachers in terms of status. For example, a PETT in the present system would not be able to obtain eventually a higher paid post in a technical *lycée*. The change at present envisaged is to require of all teachers of theory four years of higher studies in their specialty after the level of the *baccalauréat* and one year of pedagogical studies. Likewise, the qualification requirements and studies for workshop teachers (PTAs whether in the *lycées* or in the CETs) would become the same. Thus the current tendency in France is to distinguish

between teachers of theory and teachers of practice, rather than between technical theory teachers and workshop teachers in technical *lycées* on the one hand, and vocational theory teachers and workshop teachers in vocational schools on the other.

Poland

Poland, like France, possesses a comprehensive centralized national system of vocational and technical teacher education, all of which is on the tertiary level. The Polish system makes fairly large provision for crossing institutional lines and therefore for changing specialties or career directions. Figure 2, a diagram of the structure of the Polish system, shows that technical and vocational teacher education is given in all three types of institutions distinguished in this study. All institutions are on the tertiary level, with one qualification concerning the industrio-pedagogical technicums which train workshop teachers for vocational schools. The academic level attained is completed secondary education, but further technical theory and practice is offered as well as pedagogical studies.

Technical theory teachers in Poland are trained either in the technical universities or in colleges of pedagogy (*écoles supérieures pedagogiques*).[1] The technical universities train highly qualified engineers as their main function and chairs of pedagogy have been established so that the engineer who wishes to teach in two-year post-secondary technical institutions or in the technicums (technical schools) may obtain teacher qualification either concurrently with his technical studies or after. He may also take teacher qualification courses in the colleges of pedagogy after his university education. The colleges of pedagogy are general teacher training institutions on a university level, which nevertheless have two technical sections: mechanics and electricity. The candidates for the technical departments of the colleges of pedagogy must either be graduates of a post-secondary technical institution, or must be graduates of a secondary technical school with one year's experience in industry. The course lasts four to five years and includes general studies (mathematics, physics, chemistry, philosophy, psychology, foreign language), pedagogical studies, special courses and workshop practice. It should be noted that the teacher qualifications required for both the post-secondary institutions and the technical secondary schools are the same, and teachers of technical theory are encouraged

1. The information used in this section was derived from Poland's reply to the Unesco/ILO questionnaire which was received in French; hence the use of this in the names of institutions.

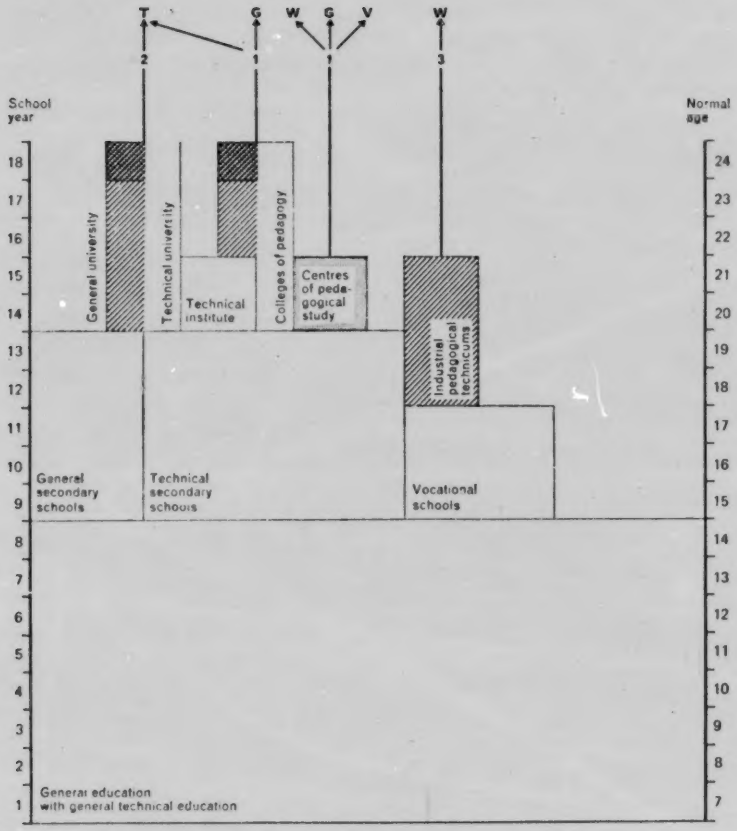


FIG. 2. Poland: educational structure. (Workshop teachers for the technical schools and vocational teachers are prepared in the same institutions.) Key, as in Figure 1.

to have had at least one year's experience in industry before taking up their initial teaching duties.

Vocational teachers are trained in the vocational sections of the centres of pedagogical studies in two-year courses, and workshop teachers in industrio-pedagogical technicums in four-year courses. The centres of pedagogical studies recruit candidates primarily from the technical secondary schools but students may also be graduates of the industrio-pedagogical technicums. Since these candidates are considered to be qualified technicians, the thrust of their studies is pedagogical with an enrichment of theoretical technical knowledge in their field. After certification from the centre of pedagogical studies, the teacher is qualified to teach practice in a technical *lycée* or theory in a vocational school (*école professionnelle du premier degré*) which trains skilled workers. The industrio-pedagogical technicums are designed to give skilled workers pedagogical training with a view to their teaching workshop practice in either a vocational school, or in some cases, in a technical *lycée*. The industrio-pedagogical technicums recruit their students from either the graduates of the vocational schools or from the ranks of skilled workers wishing to enter the teaching profession. The four-year course in these specialized technicums includes general education on the advanced secondary level (ordinary technicums or *lycée* level) as well as further theory and practice in the special field, and pedagogical studies. As in the case of the centres for pedagogical studies, the industrio-pedagogical technicums do not emphasize practical training as the students are already qualified workers or technicians.

As a general rule, all teachers of whatever category must have at least one year's experience in industry before appointment to a teaching post.

The Polish national system, then, provides pedagogical training for skilled engineers, technicians and workers to staff the various levels of the vocational and technical education system. The colleges of pedagogy and the centres of pedagogical studies also provide courses for teachers who wish to teach general technical subjects in the general education system. These candidates become neither engineers nor technicians, but teachers with a technical subject as a specialty. There are also various summer and correspondence courses offered by central and local education authorities as well as by the above-mentioned pedagogical institutions so that individuals may obtain teacher qualification or upgrade their pedagogical or technical knowledge.

The Polish system allows flexibility in professional advancement.

For example, a graduate of a vocational school of the first degree may enter a technical secondary school and become a qualified technician in three years rather than the normal four to five. He is then prepared to enter either a centre for pedagogical studies, a college of pedagogy, or a technical university. If the student from the vocational school chooses the industrio-pedagogical technicum and finishes the course successfully, he may then go on to a centre for pedagogical studies which allows him to teach practical technology in a technical secondary school or theory in a vocational school. Also the training of many vocational and technical teachers in general teacher institutions (colleges of pedagogy and centres for pedagogical studies) has two advantages: first, economy (technical teacher departments may be easily grafted onto the structure of an existing institution); and second, the technical or vocational teacher has, more easily, from the beginning of his career, status comparable to a teacher in general education.

DECENTRALIZED PATTERN

What is here called the decentralized pattern applies where the institutions, either public or private, for the preparation of technical and vocational teachers do not form a part of a national education system. In this case a local education authority—state, regional or municipal—usually bears the responsibility for policy, administration and finance of the public institutions. These public institutions may, however, have a greater or lesser autonomy depending on the educational structure and practice in any given country.

The decentralized pattern renders difficult a general description of the organization of technical and vocational teacher education, for variety rather than uniformity is the keynote. This pattern is often found in some of the most highly developed countries in terms of industry and technology, in the Federal Republic of Germany, the United Kingdom and the United States of America, for example. One of the contributing factors to the development of this pattern has been the historical development of industry. Because industrial development began very early in these regions, pragmatic solutions on a relatively individual level to the problem of technical and vocational education and to the preparation of teachers were found. The result is a welter of institutions differing in programmes and objectives. A further consequence in some countries is a tendency to make fewer distinctions among categories or types of teachers, and therefore fewer distinctions in the types of preparation offered.

Despite the rather inchoate nature of this pattern, the national government usually exercises some form of authority. This may be done through any one or all of the following: the establishment of national guidelines by legislation, systems of national examination or accreditation of institutions, or aid in financing.

United States of America

In the United States the federal government has no authority to organize a national education system for whatever purpose; this responsibility devolves upon the individual states. Through legislation the government may, however, provide funds and guidelines for the various areas of education. Vocational and technical teacher education is a rapidly changing field of ever-increasing importance and one which may be described as systems within systems, with each state developing programmes which meet its particular social and economic needs. Thus, technical and vocational teacher education, as all education, is in the hands of state and local authorities or private institutions, creating a situation where a general policy or national standards are difficult to impose yet one in which flexibility prevails.

As may be seen from Figure 3, the structure of technical and vocational teacher education in the United States is deceptively simple as is its education system as a whole. This preparation is given at the tertiary level, and, as a general rule, all teachers in secondary schools in the United States must have at least a bachelor's degree (four years' study after completion of secondary education).

Technical and vocational teacher education is given in universities (institutions awarding bachelor's, master's and doctoral degrees) and colleges (four-year tertiary institutions awarding the bachelor's degree). Although there may be special departments or faculties within these institutions concerned with technical and vocational teacher preparation, the institutions are general in nature. Therefore it may be said that virtually all technical and vocational teacher preparation in the United States is given in institutions which fall into the category of general institutions (Pattern 1). The value of a particular degree depends upon the faculty and reputation of an institution and the performance of its graduates.

Within this general pattern of education there is enormous diversity, for each institution is responsible for designing its own programme. Some institutions train all types of technical and vocational teachers as they have been defined in this study; others

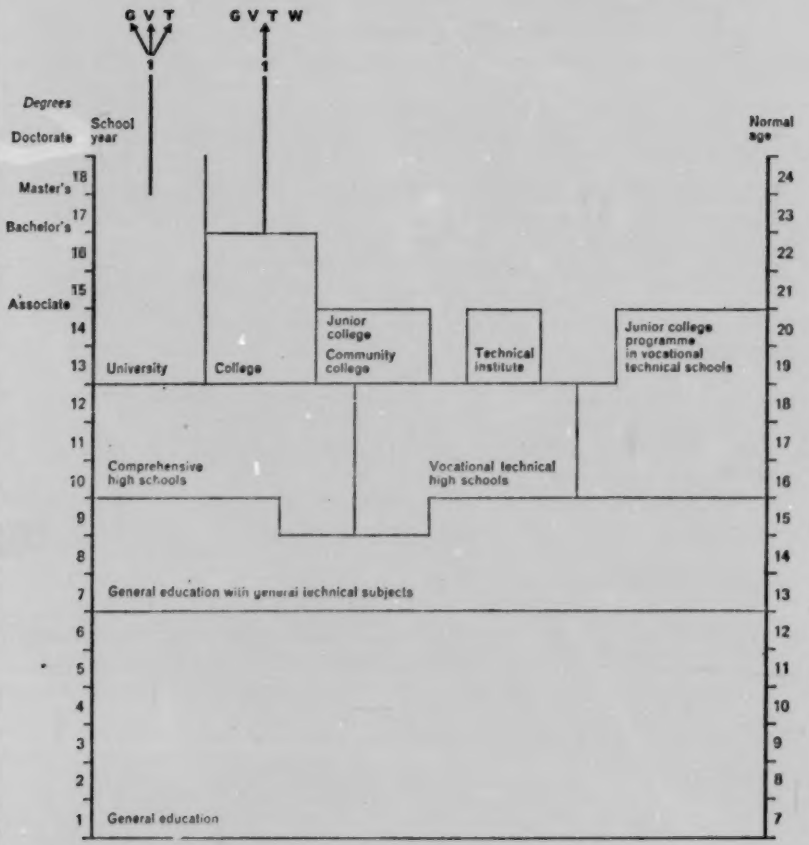


FIG. 3. United States: educational structure. Key, as in Figure 1.

specialize in one type. It should be said, however, that the United States does not distinguish as clearly between types of teacher as do France and Poland, or as does this study. The vocational teacher teaches occupationally oriented subjects on the secondary level. The technical teacher teaches technical subjects on the upper secondary or post-secondary level in the two-year technical institutes or the two-year junior or community colleges. But in the American system there is often little distinction between the workshop teacher and the vocational teacher, or the technical teacher. The whole approach to technical and vocational subjects is rather more practical in nature, the technical or vocational teacher usually teaching the workshop or laboratory subjects related to his courses.

A further significant feature of the United States system is the basis upon which most degrees in education are awarded. Each institution, taking into account professional qualification requirements set by the individual states, poses a set of course requirements which must be fulfilled before award of the degree. Each course carries with it a certain number of 'credits' or hours. Therefore once a student has successfully completed the required number of courses and gathered the required number of credits, he obtains the degree. With the credit system, an individual who has not obtained a degree may fairly easily come back into the system, not necessarily full-time, and with greater or lesser rapidity obtain the degree. Because most credits obtained in recognized institutions may be transferred to other institutions, the individual has a large degree of freedom of choice and movement.

The State University College, Oswego, New York, provides a typical example of the type of institution in which technical and vocational teachers are prepared in the United States.

Oswego offers programmes not only for those just out of secondary school, but also has initiated a programme to attract candidates who have had some form of post-secondary technician training, especially holders of an associate degree from a two-year post-secondary technical institution, with some experience in industry. The college is a university-level institution, a part of the New York State public higher education structure. The programme leads to a Bachelor of Science degree in technical education and is designed to prepare technical teachers for the secondary schools as well as the two-year technical colleges. In the past, the State of New York has required that technical teachers in the public school system be graduate engineers with experience in industry, while the selection of teachers for the colleges was left to the discretion of the college

presidents. With the increasing demand for post-secondary technical education, the demand for teachers has far exceeded the supply, hence the institution of the Oswego programme. Because the programme is designed to attract prospective candidates with varied backgrounds, an attempt is made to tailor the preparation to individual needs. For example, in co-operation with industry a work programme will be established for those who have had little or no industrial experience; alternatively, further mathematics and science courses will be available for those who have been recruited from industry and need further theoretical education.

CONCLUSION

In comparing the two general patterns of national organization of technical and vocational teacher education, significant differences may be distinguished—differences which comprise the advantages and disadvantages of each pattern. In the centralized pattern, one finds a well-defined comprehensive system with special provision for the preparation of all types of technical and vocational teacher required by the school system. Because technical and vocational teacher education is part of a national system, changes made will correspond to over-all national policy, that is, planning for the future is more easily achieved. In the decentralized pattern flexibility prevails both in terms of institutions' ability to adapt rapidly to changes in a particular field and in terms of opportunities offered to prospective students. For example, an autonomous institution may develop experimental programmes more easily.

When the specific cases described are compared, one sees that while in France, and to a lesser degree in Poland, there is great disparity between the academic levels of the various categories of technical and vocational teacher, in the United States this level is virtually the same for all. It is significant, however, that France plans to close the gap between technical and vocational teachers of theory on the one hand, and between technical and vocational workshop teachers on the other. Furthermore, in France theory and practice are sharply distinguished, while in the United States this is not at all the case.

Certain conclusions relevant to developing countries may be drawn from these comparisons. Teacher education in both patterns occurs on the tertiary level with a reservation as to workshop teacher training. In developing countries, although it may not be feasible to require this level of academic qualification at present for all types of technical and vocational teachers, this may nevertheless

be a valid goal. But perhaps the most important problem facing developing countries is planning for technical and vocational teacher education in relation to an over-all plan for development. This can only be done on the national level, which presupposes some degree of centralization. On the other hand, conditions are changing rapidly in developing countries and therefore institutions need to be created which may respond effectively and rapidly to new needs and directions. And it seems to be the case that institutions endowed with a relative degree of autonomy are more capable of this response. Thus for developing countries these patterns can only serve as general guides. Some kind of system which might be described as a balance of these two patterns, including a central direction and flexible institutions, would seem to be the best pattern of over-all organization. Whether the pattern would tend to the centralized or the decentralized would depend upon the conditions prevailing in the individual country.

INSTITUTIONAL PATTERNS

In the introduction to this chapter, three general patterns of institutional organization for technical and vocational teacher preparation were distinguished. Pattern 1 is that of the institution which, while offering general courses of study, offers technical and vocational subjects and teacher preparation as well. The colleges of pedagogy in Poland and United States institutions as a whole follow this pattern. The second pattern is that of the technical university or institution which offers pedagogical courses leading to teacher qualification as well. The technical universities in Poland serve as a typical example of this pattern. Pattern 3 is composed of those institutions which are designed specifically for technical and/or vocational teacher preparation. Included in this pattern are those institutions which offer pedagogical preparation almost exclusively as well as those which offer a comprehensive programme including all of the components of study required by technical or vocational teachers, i.e. general studies, special theoretical and practical technical or vocational studies and theoretical and practical pedagogical studies. Most of the major institutions in France for the preparation of these teachers fall into this third category, although with the increasing importance of the regional pedagogical centres, this is changing.

In the following pages these institutional patterns and typical examples of them will be analysed more closely. Obviously the

distinctions are somewhat arbitrary. For example, technical universities may offer general programmes as well, and therefore could be described as belonging to the first category. More specifically, the programme at ENNEPs in France falls definitely into the third category; yet, because it includes some general technical studies in addition to the pedagogical subjects, it could be described as belonging to the comprehensive type of special institution. On the other hand, the purpose of these institutions is to give pedagogical preparation to future vocational and workshop teachers. Throughout this study institutions will be placed in one of the categories of patterns on the basis of the major thrust of the programme in any given institution. While these sharp delineations may not be fully justified, they are nevertheless useful as long as they are understood as necessitating some qualification in virtually all cases.

GENERAL INSTITUTIONS

The 'general institutions' category is composed of several types of institutions. These may be colleges or universities with departments or faculties of education which award diplomas or certificates in a wide variety of subjects or they may be institutions whose primary goal is teacher training but which prepare teachers of all subjects offered in the schools.

Japan

Virtually all institutions in which teachers are prepared in Japan fall into this first category, with the exception of the vocational training institutes which train workshop instructors for both the schools and industry.[1] Japan has special pedagogical universities and colleges for the preparation of primary and lower secondary school teachers. Most teachers of technical or vocational subjects on the upper secondary level are prepared, however, in general colleges and universities. Students follow a four-year comprehensive course which includes general subjects, pedagogical subjects, and general and special technical subjects. Degrees and teacher qualification are awarded on the basis of a credit system: the student must have acquired a required number of course credits in each subject area. Before a teacher is employed he must pass an examination given by the local education board.

The Japanese system of higher education and the preparation of teachers as a whole resembles that of the United States. Yet there are

1. See discussion of these institutions in Chapter IV.

significant differences. The colleges and universities in which technical and vocational teacher preparation is given may be national institutions, local public institutions, or private institutions. Thus, in contrast to the United States, Japan has an element of national control in institutional terms. Furthermore, in order that an institution be able to award teacher qualification, the pedagogical programme must be approved by the Ministry of Education, for the requirements for teaching certificates are prescribed by national law. Thus Japan, while providing an example of technical and vocational teacher preparation in general institutions, also provides an example of an over-all system which combines centralized national direction with some degree of local and institutional autonomy.

TECHNICAL INSTITUTIONS

In a number of countries technical and/or vocational teachers are prepared in technical institutions which have pedagogical faculties or departments attached. This institutional pattern is a fairly common one for the preparation of technical theory teachers on the upper secondary or post-secondary level. Although less usual in the case of vocational teachers, there are exceptions: for example, the Federal Republic of Germany, as will be seen in Chapter V. In this second type of institution, usually two courses are open to students wishing to enter the teaching profession: on the one hand, a full engineering or technical course after completion of which a pedagogical course is followed; and on the other, a comprehensive course in which pedagogical studies are followed concurrently with technical and general subjects courses.

Israel[1]

As a whole Israel possesses a fairly comprehensive system of technical and vocational teacher preparation, but it has been in operation for a few years only. Many of the elements within the system are still in an experimental stage and are in the process of being revised.

The Technion Israel Institute of Technology at Haifa provides a typical example of the second institutional pattern. This institute is designed primarily to train engineers, but two programmes have been instituted which lead to qualification as technical theory teachers for advanced courses in vocational schools. The first programme, of four years' duration, leads to the degree of Bachelor

1. Israel, reply to Unesco/ILO questionnaire and reply to questionnaire on draft

of Science in Education. The second way for the prospective teacher is to take pedagogical courses in conjunction with his engineering studies. At graduation he has a pure engineering degree as well as teacher qualification. Entrance requirements to the Technion for future technical teachers (called technology teachers in Israel) are as follows: (a) a *bagrut* (matriculation) certificate, academic or technical (graduates of technical secondary schools are given priority); (b) the average grade of the candidate must be at least seven (between C and B). Students whose average grade is below requirement are obliged to sit for entrance examinations in mathematics and physics, equal to those required from candidates applying for engineering studies. The syllabus for the four-year Bachelor of Science in Education programme includes general science subjects, optional humanities, as well as courses in the special technical field. No practical training in the special field is included in the syllabus, a weakness throughout the Israeli system.

The Technion Research and Development Foundation is an institution associated with the Technion Israel Institute of Technology and operates in co-operation with the Ministry of Education and Culture. This institution in the past served a dual function in vocational and technical teacher education. On the one hand it provided part-time courses to prepare engineers, already teaching but without pedagogical qualifications, for special teacher certification examinations. On the other hand the foundation directed two institutes for vocational teacher training which recruit students from the ranks of experienced technicians with two years' post-secondary technical education. The programmes in these institutions are not considered to have a university academic level. In the course of the academic year 1972/73, the courses for graduate engineers will be transferred to the Technion and the foundation will only offer programmes for the preparation of vocational teachers. It should be noted that Israel also plans to institute in the near future facilities for training technical teachers within the framework of the newly created engineering department at the University of Tel Aviv.

SPECIALIZED INSTITUTIONS

The pattern of specialized institutions includes a wide variety of teacher preparation facilities which range in level from advanced secondary institutions to university institutions and which may prepare one or several types of technical and vocational teacher. Generally it may be said that these institutions offer either a strictly

pedagogical programme or a programme of integrated studies. The Colleges of Education (Technical) in the United Kingdom provide a typical example of the former, and the latter, as will be seen below in the case of Nigeria, is the pattern currently most typical in developing countries.

United Kingdom

The Colleges of Education (Technical) in England, of which there are four, provide one example of a specialized institution on both the graduate and post-graduate levels.[1] These institutions admit candidates either holding university degrees or possessing appropriate technical qualifications and provide pedagogical training with special reference to their respective technical field. Candidates may come with degrees in a technical field or may hold one of a number of diplomas and certificates awarded in the United Kingdom (e.g. Full Technological Certificates of the City and Guilds of London Institute, Higher National Diplomas and Certificates, or membership of various professional institutions). Because of the qualifications and experience required, the majority of students do not enter before their late twenties. The one-year course which may lead to either a Certificate in Education or a Graduate Certificate in Education (for those holding degrees) emphasizes the theoretical and practical pedagogy but also includes more general studies. Because the future teachers have already achieved their full technical qualifications no further training in their special fields is offered in the one-year course. However, there is also a special four-term arrangement where in the first term (summer) students may take an individual course designed to bring up to date their practical and technical knowledge, including laboratory skills. The normal course, designed to encourage critical thinking, includes general theoretical pedagogics (history of education, educational philosophies, adolescent psychology, etc.), and teaching methods in the special field which usually involves project work. Twelve weeks are devoted to practice teaching, normally in a technical college. In one college the performance of the student teacher is evaluated throughout the course by his tutors working in association with external examiners, who usually include a principal of a technical

1. See: A. MacLennan, 'The Supply and Preparation of Teachers and Ancillary Staff', *Education and Training of Technicians*, p. 147–84, report of a conference of experts held at Huddersfield College, October 1966, by the Commonwealth Liaison Committee, London, HMSO, 1967; and United Kingdom reply to questionnaire on draft.

college and a university professor of education. There are also external assessors of practical teaching. Depending on the university concerned, there may be no further final examination required for either of the certificates although these are frequently held. Each of the four Colleges of Education (Technical) is associated with a local university and its institute of education through an area training organization. It is these bodies which are responsible for providing the external examiners and for awarding the certificates. Nevertheless, the technical colleges are special and largely autonomous institutions. The colleges also provide a variety of in-service courses including some that enable practising but unqualified teachers to achieve qualification. The colleges maintain contact with industry through activities of members of staff, by having people from industry on the directing boards, and also in some instances, by offering courses for training-officers in industry. These courses are designed in close contact with the specific industry so that the needs of the enterprise may be met.

In sum, the English system of Colleges of Education (Technical) provides one example of how future teachers on a variety of levels may be given pedagogical training in a country in which there is no rigid distinction between technical or vocational, practical or theoretical teachers. It could perhaps serve as a guide for converting, in a relatively short time, technicians and workers or those with university degrees who wish to enter the teaching profession into technical and vocational teachers. It does, however, assume knowledge and experience before entrance and is designed to provide special pedagogical training for those with the appropriate specialist qualifications.

IN-SERVICE PATTERNS

In the preceding sections, the organization of vocational and technical teacher education has been discussed in terms of national and institutional forms or patterns and the examples used have illustrated pre-service preparation. Yet another form of organization should be mentioned: the in-service pattern.

The term 'in-service' applies to the forms of education and training organized for those already employed as teachers. In-service education may be given in order that an employed teacher acquire initial teacher qualification or it may be given for the updating of technical and/or pedagogical knowledge. We are here concerned with in-service education for initial teacher qualification.

A number of countries employ technical and vocational teachers on the basis of their technical qualifications and experience, and require that they obtain teacher qualification through in-service training if they wish to remain in the profession. This pattern of recruitment into the teaching profession preceding pedagogical education may be the primary way in which vocational and technical teacher education is organized or it may exist concurrently with pre-service preparation. The in-service pattern may exist in both centralized and decentralized national systems, and may be directed by one or more of the types of institutions discussed above or organized under the aegis of public education authorities. The sandwich system which occurs in the United Kingdom is a variation of this pattern. According to this form, a teacher is employed on the basis of his technical qualifications, and teaches and studies in alternate semesters. Czechoslovakia provides an example of this pattern of training through external correspondence courses. It should be noted that although some type of provision for in-service initial teacher qualification should be available in developing countries, this pattern in most cases is not the most appropriate, for trained manpower is so scarce that recruitment of teachers from employment is rendered difficult indeed. Therefore emphasis must be given for the present to the development of relatively long integrated institutional programmes.

Czechoslovakia[1]

In Czechoslovakia virtually all technical and vocational teachers receive their pedagogical preparation through in-service courses. Teachers of vocational and technical subjects in the industrial high schools have almost without exception technical university degrees. Vocational teachers who, having passed the school-leaving examination, have complete secondary vocational education and employment experience, teach in the apprentice schools or vocational training centres which offer basic vocational training as well as general education in close connexion with industry. Vocational training centres are attached to each large industrial enterprise. Graduates of the nine-year compulsory primary school who take up employment in industry attend these schools usually for three years for both their general and vocational education. Where an enterprise is not large enough to support a training centre, a workshop

1. See: Czechoslovakia, reply to Unesco/ILO questionnaire; reply to questionnaire on draft.

centre on the factory premises is arranged for the practical instruction of the pupils, who then receive their general and theoretical technical education in the apprentice schools run by the national district committees.

Both vocational teachers at the apprentice schools and the vocational training centres, and technical and vocational teachers in the industrial secondary schools, are hired on the basis of their technical qualifications and experience and all obtain pedagogical qualification through in-service courses. These external correspondence courses are offered by pedagogical faculties, either attached to university institutions, e.g. the University of Prague, or independent. Teachers in the apprentice schools and vocational training centres follow three semesters of supplementary pedagogical study at the end of which an oral examination is taken. The passing of this examination, while leading to qualified teacher status, does not carry with it university status. These courses are thus on the post-secondary level. Teachers for the industrial secondary schools follow a four-semester pedagogical course at the end of which a State examination is given for full teacher qualification. Because students in this course have university degrees, the course is on the post-graduate level.

TRENDS IN DEVELOPING COUNTRIES

Developing countries beginning programmes of technical and vocational education and training have the opportunity to avoid some of the weaknesses inherent in the systems of developed countries. In the last decade as developing countries have begun to create systems of vocational and technical education, the problem of how to train qualified teachers for future skilled workers and technicians has been recognized as being of prime importance. In the past, many countries were forced to rely on foreign teachers or teachers trained abroad, but the supply is too short to meet the increasingly heavy demands of vocational and technical education. And so short-range and long-term programmes have been instituted to train teachers at home, although in most cases the recruitment of training staff for these institutions must still be done abroad.

Developing countries must find the human and material resources necessary for establishing such programmes. A number of resources are available under the aegis of international agencies and through foreign aid agreements. The International Labour Office and Unesco, for example, are now deeply engaged in providing advisers,

personnel, and funds for such programmes, often in conjunction with one or more industrialized countries or with private foundations. Assistance is being given both on the national and the regional level. Great efforts have been made to create domestic teacher training facilities as economically as possible and in correspondence with the needs of the particular country. Also great attention has been given to the establishment of long-range goals so that short-term solutions may lead to the organization of a system which is both flexible and co-ordinated. Because developing countries must consciously plan, even in the initial stages, hopefully the achievement of the long-range goals will thereby be facilitated.

Several general organizational trends may be distinguished in developing countries. In terms of the over-all system of technical and vocational teacher education, most developing countries exhibit the centralized pattern, in that, of necessity, it has been the central governments which have taken the responsibility for initiating programmes and providing for institutions. Therefore the national governments have retained authority over the system as a whole. On the other hand, in most such countries facilities for technical and vocational teacher preparation are usually limited to one of a very restricted number of institutions. These institutions are then at present pilot institutions in which methods and programmes will be developed which will eventually be extended throughout a given country. In terms of patterns of institutional organization, the most common is at present institutions which fall into Pattern 3 (specialized institutions). These institutions may offer integrated courses on the diploma or degree level (post-secondary or university), courses primarily pedagogical in nature, or both types of programmes. To be sure, one does find departments of technical education attached to general or technical universities, but these patterns occur more rarely.

Regional co-operation forms a trend apart, but one which appears to be promising for a number of developing countries linked with neighbouring countries by geography, language and/or culture. Within this pattern, there are a number of possibilities for establishing joint research programmes, exchange of information and even teacher or teacher-educator preparation facilities.

One project in Africa, begun in the mid-sixties, provides a typical example of trends in developing countries in the field of vocational and technical teacher education. The Colombo Plan serves to demonstrate the possibilities of regional co-operation for social and economic development, including the local preparation of technical and vocational teachers.

Nigeria

In 1962, Nigeria began investigating possibilities for reforming the school system and for establishing a system of vocational and technical education.[1] In this year a group of Nigerian educators returned from having studied various school systems abroad and were quite impressed with the idea of a comprehensive secondary school which has both academic and technical streams. A highly successful prototype school was created and a number of others begun. It is hoped that these schools will serve to change traditional attitudes which consider vocational and technical education radically separated from academic studies and as having considerably lower status. The goal is to create a pool of manpower from which students for training as craftsmen and technicians, as well as their teachers, may be drawn. In addition to the one comprehensive school, Nigeria had, in 1966, ten vocational schools and several technical colleges.

The initial efforts toward reform and improvement of the vocational and technical education system included a proposed National Technical Teachers College and the establishment of the Nigeria Technical and Commercial Examinations Committee within the West African Examinations Council—a body responsible for the setting of national education standards and recognized qualifications. A Comparative Technical Education Seminar Abroad (CTESA) was established with a grant from the Ford Foundation which allowed Nigerian educators to study various foreign systems of vocational and technical education. As a concerete step toward establishing the Technical Teachers Training College, the ILO set up a training scheme in Lagos for future vocational teachers, sponsoring a programme at the Yaba Trade Training Centre, the one vocational school where students may prepare the Final City and Guilds of London Institute Craft Certificate as well as take pedagogical courses for teaching in vocational schools.

The original project of 1967 for establishing the National Technical Teachers Training College at Lagos to incorporate and extend the functions of the ILO scheme with the aid of Unesco and the Special Fund of the UNDP proved unsuited to the existing conditions in Nigeria. According to this first plan, the college was to give pedagogical training to persons already in possession of the appropriate technical or craft qualifications. It was found impossible

1. See: CTESA, *Report of the Comparative Technical Education Seminar Abroad and Recommendations for a National Plan of Vocational and Technical Operation in the Republic of Nigeria*, Lagos, African Educational Press, 1966, 132 p.

to attract people of this technical calibre into the teaching profession with its lower status and lower pay. Also, no provision was made for an integrated course which would lead concurrently to technical and pedagogical qualification. In 1969, the goals of the project were changed. The college retains the one-year pedagogical programme for those with technical and commercial qualifications leading to the technical teacher's certificate. Those awarded this certificate teach in either the vocational schools or centres or the technical institutes depending upon whether they had craft or technician qualifications at entry. The main effort of the college in the initial stages, however, is devoted to developing a three-year course to train teachers of technical or commercial subjects in the comprehensive secondary schools. In a sense these are more modest goals and certainly more basic. For it is hoped that with the institution of good technical courses on this level taught by qualified teachers, more and better qualified students will go into further technical and commercial education. Students in the technical teachers' programme are taken directly after secondary school and follow an integrated technical and pedagogical course. Upon completion of the programme, they receive either the Nigerian Certificate of Education (Technical) or the Nigerian Certificate of Education (Commercial). In addition the college will provide in-service courses for the upgrading of existing teachers. Also envisaged is the establishment of a production unit which will allow students to have a simulated industrial experience. By means of the production unit it is hoped that a solution to the problem of providing industrial experience for future technical teachers will be found—a problem which has proved a stumbling-block to the establishment of sound technical and vocational teacher education in all developing countries and one which will be referred to a number of times in the course of this study.

The Colombo Plan

The Colombo Plan was established in 1950 for the goal of promoting the economic and social development of south and south-east Asia. The regional members are: Afghanistan, Bhutan, Burma, Sri Lanka, India, Indonesia, Iran, the Khmer Republic, Republic of Korea, Laos, Malaysia, Maldive Islands, Nepal, Pakistan, Philippines, Singapore, Thailand and Republic of Viet-Nam. Non-regional members are: Australia, Canada, Japan, New Zealand, the United Kingdom and the United States of America. All aid is

negotiated bilaterally between the receiving and the donor country. One of the most difficult problems facing developing countries in vocational and technical education is the training of middle-level technicians, and in May 1969 the Colombo Plan held a colloquium on the problem in Singapore. At this time, several speakers dealt with technical teacher training, and one offered proposals for regional co-operation.[1]

It was proposed that a regional centre be created to serve several functions, among them the training of teacher-educators, the training of technical teachers for countries too small to have their own systems of teacher training, the training of executive and administrative cadres on the Master of Science in Education level, and the provision of research and information facilities. One of its most important functions would be to set standards and goals to be followed by all regional members for developing their systems of vocational and technical education. Institutions in member states could ask that an assessor from the centre be sent to evaluate student-teacher performance. In this way, variations in standards could be minimized. The proposal was made to organize and co-ordinate existing exchange programmes, and some commentators argued that, given these exchange programmes, a centre would be superfluous at the present moment as there were several possibilities of upgrading existing institutions to serve the purpose. India, for example, encourages regional members to send students to her institutes for teacher training; Japan's Institute of Vocational Training has, as one of its functions, the training of vocational instructors from overseas. Yet all agreed that the creation of such a regional centre could not be objected to in principle, just as all agreed it would take much serious study before such a project on a large scale could be realized.

Any number of obstacles exist to such forms of regional planning. The diversity of existing educational systems, the financing and staffing of such an institution, and, very important, the variation in language—are all barriers. For, unless there is a *lingua franca*, regional planning is very difficult indeed. In the case of the members of the Colombo Plan, however, fluent (or some) English is usually spoken, so a centre is feasible from this point of view. On the other hand, the advantages of regional co-operation are great. The cost would be less to each individual country, effort and resources could be pooled.

1. Colombo Plan, *Intra Regional Technician Training, Colloquium Report*, Singapore, Colombo Plan Bureau, May 1969, 204 p.

SUMMARY AND CONCLUSIONS

The foregoing analysis and description is intended to serve as a guide through the labyrinth of current provision for technical and vocational teacher education. Two patterns of organization on the national level and three patterns of institutional organization have been delineated, as well as the in-service pattern. Certain trends in developing countries have been pointed out. This chapter has therefore been concerned with form rather than content. Content will be dealt with in following chapters in the discussions of patterns of preparation and programme content for each of the four categories of teacher distinguished in this study, as well as for the training of instructors and training-officers for industry.

From the general context presented in this chapter, certain conclusions relative to developing countries may be drawn.

Concerning organization on the national level, it is obvious that most developing countries will be unable in the near future to create a comprehensive organization of technical and vocational teacher education which prepares all types of teachers required. There are too few resources, human and material, and too many other problems demanding immediate attention. Yet institutions, programmes and projects now being instituted in many developing countries, which fulfil a pilot or experimental function, should be seen in terms of long-range national education policy. As such, they should be centrally directed on the national level while retaining a certain amount of flexibility in order to adapt to the rapidly changing conditions in these countries. Few countries engaged in a conscious programme of economic and social development can, in the twentieth century, permit themselves the luxury of undirected expansion.

Of the three patterns of institutional organization, some variant of the specialized institution appears to be the trend taken in most developing countries. This type of institution has several advantages. Programmes for several categories of technical and vocational teachers may be given more easily in the same institution. Workshop and laboratory facilities geared especially to the requirements of technical and vocational teachers may be constructed and used for the several programmes, a question of economy very necessary when resources are limited. Furthermore, a specialized institution, through the concentration of efforts, may be more effective in the development of technical and vocational teacher education than an institution in which this preparation is but one aspect of its activities. There are, on the other hand, certain advantages to both the pattern of teacher preparation within a general institution and that

of teacher preparation within a technical institution. Faculties of technical education may be rather easily added in both cases to existing facilities, and therefore the expense of the construction and administration of a new institution avoided to a certain extent. General institutions offer a further advantage in that, by preparing teachers of general as well as technical subjects, technical and vocational teachers are better integrated into the profession as a whole. On the other hand, teacher preparation in technical institutions has the advantage of providing a common technical background for both teachers and those employed in the field.

The in-service pattern has the general advantage of permitting experienced people to enter the teaching profession and obtain qualification while employed. Although this pattern for achieving initial teacher qualification might be useful for developing countries in the future, at present it is relatively rare that the desperately needed trained manpower from industry, commerce, agriculture, etc., is available or willing to take advantage of such facilities.

While the patterns existing in developed countries may serve as guides to those in the process of development, their advantages as well as their defects should be borne in mind. The experiences of developed countries in organization may serve as a model, positive or negative, for the establishment of long-range goals, as well as for the adoption of immediate measures, but only in so far as they may be adapted to another culture with different traditions and different needs.

The establishment of a broad system of technical and vocational education in developing countries pre-supposes thorough-going educational reform. Such a reform will affect not only upper secondary and tertiary education but upper primary and lower secondary education as well. For, as was pointed out in earlier pages, attitudes which question the value of technical and vocational education form perhaps the largest stumbling-block to progress in this field. Increasing numbers of educators recognize that this situation can only be changed by introducing some form of general technical education into the general education schools. Seen in this light, the preparation of general technical teachers assumes a position of high priority on the list of objectives for developing countries. Obviously this basic reform does not preclude the concurrent development of programmes and institutions for technical and vocational education proper and for the preparation of these teachers. On the contrary, action must be undertaken in each of these areas of technical and vocational education and of teacher preparation as part of the total effort of meeting the challenge of development.

Any attempt to categorize is somewhat arbitrary and leads to over-simplification. Despite the rather rigid categorization of the foregoing analysis, the widest variation characterizes existing and projected organizational forms for technical and vocational teacher education. Constant change further characterizes the field, for industrialized countries, whose technical and vocational teacher preparation programmes have mostly evolved willy-nilly as appendages to traditional structures of apprenticeship or of general teacher training, have found it necessary to reform, often radically, the organization of technical and vocational teacher education. The relatively recent development of technical and vocational teacher education on a systematic basis is still in process. No industrialized country really feels free to rest on its laurels in this area, and no developing country can afford to ignore this field so important for economic and technological development.

CHAPTER III

PREPARATION OF GENERAL TECHNICAL TEACHERS FOR GENERAL EDUCATION

The introduction of general technical education on a broad basis in general education schools, as was argued in the concluding paragraphs of the preceding chapter, may well prove to be a key factor contributing to progress in technical and vocational education and thus to the long-range economic and social progress of developing nations. The preparation of competent teachers for this type of education is therefore of fundamental importance.

In the first place, it should be made clear what is here meant by general technical education. This type of education, of rather recent vintage in the vast majority of countries, is known by a variety of labels. A few examples serve to demonstrate the confusion in terminology: 'industrial arts' in the United States, 'polytechnical education' in the U.S.S.R., 'technical orientation' or 'elementary technology' in France and other countries and 'pre-vocational education' in still others and by some international organizations. All, however, refer to the provision of a basic technical education which is part of the general education of the population and which is provided in general schools. On the one hand, this type of education is to be distinguished from technical or vocational education as they have been defined in this study, which constitute in part a preparation for employment in an industrial, commercial, agricultural or other occupational field. Furthermore, general technical courses are to be clearly distinguished from traditional handicraft courses designed to teach manual and artistic skills. General technical teachers must prepare their pupils to understand the modern technological world, not simply teach them how to make bowls and baskets.

General technical education is, then, a general introduction to modern technology, given as part of the required general course of study on the upper primary or lower secondary level—that is, in grades five to nine or between the ages of 10 and 15.[1] The purpose

1. See Appendix I.1, 'Educational Structure Model'.

of this type of education is to acquaint schoolchildren with the world of modern technology in its relation to modern society as a whole, as well as to instil some basic theoretical concepts and provide practical experience in using tools and materials in various technical areas. It is not designed to train pupils in specialized skills. With few exceptions, basic technical education has not been a part of general education systems. The traditional compulsory primary and now most often compulsory lower secondary education was geared to academic studies. When a pupil had demonstrated that he had little academic aptitude, he was directed into the vocational and technical secondary schools. For, when vocational and technical education was admitted into the education system, it was usually isolated from the system as a whole in separate institutions. Consequently, these separate institutions were considered second- or third-rate schools rather than quality institutions for students with talents other than academic. Even where comprehensive schools exist, there was often a tendency to give vocational and technical education in separate streams rather than integrated into the general programme. As a result of the traditional organization of education, general technical courses were not considered a part of general education but rather given for those, who, weak in academics, were shunted off into the vocational schools or streams.

This state of affairs, rather gloomy from the point of those interested in promoting general technical education, is at present changing rapidly. There is an increasing recognition of the value of such courses as a part of every child's education, as witnessed by the increasing amount of literature, the numerous programmes being developed, and the general attention given to this concept of education. Not only are programmes being instituted in developing areas but industrialized countries are in the process of changing traditional education to include elementary technology for all students. One example, in addition to those discussed below, may be adduced in the case of the United Kingdom. Under the sponsorship of the Schools Council, a pilot project in applied science and technology has associated grammar, technical and comprehensive schools as well as technical and further education colleges and universities, in developing new material in technology primarily for use in the schools. This material is designed for non-scientists as well as scientists. Furthermore, two recent international seminars, sponsored by Unesco, attest to the increasing interest of developing countries in this type of education: one on 'The Introduction of Technology into General Secondary Education in Africa South of the Sahara', held at Dakar from 23 June to 11 July 1970, and the

second on 'Elementary Technology as a Component of General Secondary Education in Africa', held in Nairobi from 15 to 25 November 1971.

These changing attitudes are determined by a growing awareness that: '. . . General education should not be limited to providing knowledge, but should also prepare every student for active participation in life by providing him with an understanding of the production and utilization of goods created with the help of technology and with a better comprehension of the world in which he lives.'[1]

General technical courses as a part of compulsory general education are, then, to be highly recommended for a number of reasons. In such courses, designed to relate hand and mind, doing reinforces learning and thus they would show in a more general way how the learning process may be improved through practical activities. Such courses would give general insights into the nature of modern technological civilization necessary and appropriate for all students whether they will be pipe fitters or philosophy teachers. Furthermore, general courses given in roughly the fifth to ninth years of compulsory schooling would serve to guide those with the interest and aptitude into technical streams on the upper secondary level. These courses would then become a positive means of recruitment to vocational and technical studies, replacing the negative one of recruiting those students from academic failures. General education would then come more nearly to fulfilling the needs of all schoolchildren. Another factor in the value of general technical studies, in close connexion with the function of permitting a better evaluation of the interests and aptitudes of the individual student and therefore better guidance, should be mentioned. Technical and vocational education has in the past tended to train students with the specialized skills needed for immediate employment. With the rapid changes in methods, materials and techniques taking place in all technical fields, a different type of worker and technician is needed: one with the ability to apply his knowledge and skills under new and different circumstances. A general technical education as the foundation for special studies would provide future workers and technicians wit[illegible]e breadth of view and modes of thinking necessary for diversity and adaptability in his field. Also, such courses would facilitate the on-the-job training of early school-leavers.

Perhaps the most telling argument for the introduction of general technical education is that it leads to greater democratization of education. In the past, education beyond the primary level, and

1. Unesco, *Recommendation concerning Technical and Vocational Education*, Article 8.

often even at the primary level, was reserved for an élite. Virtually all nations subscribe to the principle of the democratization of education, that is, the right of every individual to an education. Article 1 of the Convention against Discrimination in Education adopted by the Member States of Unesco in 1960 provides clear evidence of the acceptance of this principle:[1]

'For the purpose of this Convention, the term discrimination includes any distinction, exclusion, limitation or preference which, being based on race, colour, sex, language, religion, political or other opinion, national or social origin, economic condition or birth, has the purpose or effect of nullifying or impairing equality of treatment in education and in particular:

(a) Of depriving any person or group of persons of access to education of any type or any level;
(b) Of limiting any person or group of persons to education of an inferior standard;
(c) Subject to the provisions of Article 2 of this Convention, of establishing or maintaining separate educational systems or institutions for persons or groups of persons; or
(d) Of inflicting on any person or group of persons conditions which are incompatible with the dignity of man.'

To implement this principle:[2]

'The States Parties to this Convention undertake furthermore to formulate, develop and apply a national policy which, by methods appropriate to the circumstances and to national usage, will tend to promote equality of opportunity and of treatment in the matter of education. . . .'

The introduction of general technical courses would serve to implement the principle, in that the general education system, particularly that part which is compulsory, would serve to develop the talents and aptitudes of the numerous schoolchildren at present given short shrift by the traditional academic system.

The values to be derived from general technical education would be beneficial to all countries, industrialized or in the process of development. There are in addition particular reasons for including basic technical education in general education in developing countries. The vast majority of children in developing countries have not been exposed to modern technology in their everyday life. They are not surrounded by the mechanical toys, television, home

1. Unesco, *Convention against Discrimination in Education*, Article 1.
2. Ibid., Article 4.

appliances, etc., that are an integral part of the experience of virtually every child in industrialized countries. Therefore general technical courses would serve as an introduction to this world which is not a part of the child's immediate experience but likely to be a part of his future. Furthermore, it is likely that the integration of basic technical education into the general school curriculum would help overcome the prejudice against manual work often widespread in developing areas, and the attitude that education on the secondary level must lead necessarily to a desk job.

General technical education then serves three major purposes. It gives all schoolchildren a common background in understanding the nature of modern technological society, and with this, serves to further the democratization of education. A general technical education would strengthen secondary vocational and technical education by attracting more and better qualified students. And such courses would better prepare school-leavers with no specialized skills to find employment and would facilitate their on-the-job training.

If general technical courses are in the experimental stages in many countries, programmes for preparation of general technical teachers are even less advanced. Yet teacher preparation is the key to educational reform, for any reform initiated by legislation or administrative action will simply remain on paper unless qualified personnel are available to implement it.

The general technical teacher has a difficult role to perform. He must have a solid grounding in scientific, mathematical and technical theory, as well as an understanding of the practical application of these theories and ability to demonstrate them. He must be able to use an object, a product of human technology, lying within the pupil's experience as a starting point and then lead him through the process of inductive thinking so that he may arrive at an understanding of the principles according to which the object was designed and works. But perhaps the most difficult problem is that teachers in such courses must be familiar with a variety of technologies, and to be able to relate them not only to each other but other areas well—history, science, economics, for example—so that the pupil will view technology in the larger context of modern society. The general technical teacher is not so concerned that the child be able to make an object, or to operate a piece of machinery, but rather that he understand a mode of thinking, how to approach a technological problem, and how he may relate a special technology to other areas. Thus the programme content of general technical teacher training must not only include

general subjects, pedagogy and technical studies. It must also include an interdisciplinary approach in terms of diverse technologies and how they relate to various other subjects in the school curriculum.

Very few programmes designed specifically to prepare teachers for general technical courses exist. Usually teachers are recruited in one or two ways. Either these teachers are appointed from the ranks of existing technical and vocational teachers, or teachers of general science or mathematics are recruited and after in-service courses are given the responsibility for general technical courses. On occasion these teachers may be drawn from the ranks of industry, but this source of recruitment has not proved highly successful. For a craftsman with no further training, qualified as he may be in his field, may be able to teach certain skills but not in the broad context necessary for general technical education. This source of recruitment is far more appropriate for workshop teachers in more advanced and specialized programmes. There are several disadvantages to these usual means of staffing general technical education. In the first place the teacher may not be well equipped for his task which is to teach both the theory and practice of a wide spectrum of technologies on a relatively elementary level. The trained vocational or technical teacher may have too specialized an approach; the converted mathematics or science teacher may not have the necessary grasp of technological problems. It therefore seems desirable that, wherever possible, special teacher training programmes should be created.

With the increasing recognition of the importance of general technical studies, both as a part of general education and as serving a function of orientation towards technical and vocational education, special teacher preparation programmes are now being developed. These programmes usually take one of several forms: in-service courses of varying lengths; two- or three-year diploma or certificate programmes; degree programmes, three to four years in length; and six-month to one-year courses designed to convert recruits from industry to teaching. Since these teachers are called upon to teach in the general schools, it seems desirable that they be trained in general teacher preparation institutions (Pattern 1) rather than in specialized institutions for technical and vocational teacher preparation.

The discussion will be focused first on how some industrialized countries prepare general technical teachers, and then on some of the projects, either in the planning stages or in the process of execution, in developing countries.

GENERAL TECHNICAL TEACHER PREPARATION IN INDUSTRIALIZED COUNTRIES

In the decade of the sixties, where they did not exist before, various forms of general technical courses were introduced in the lower secondary schools of a number of industrialized countries. These courses were conceived for differing purposes. Often they have functioned primarily orienting certain students into the vocational and technical schools or streams. In other countries, particularly the U.S.S.R., the United States and several countries of Eastern Europe, some type of required general technical course has long been viewed as a part of general education.

Even where such courses have been introduced, teacher-preparation programmes in the field have lagged behind. The courses have been staffed by people trained primarily as vocational teachers or by teachers of natural science. Initially, the usual process of teacher preparation was by means of in-service courses, but as general technical education has been made a part of the general education system, specialized programmes have been developed. These programmes, as will be seen in the following discussion, vary widely as to duration and content. This variation depends on a number of factors, among them the conception of the function of general technical education, the age level at which it is given, and the groups of people from which the teachers are recruited.

Union of Soviet Socialist Republics

The U.S.S.R. possesses, since the school reform of 1958, a very highly developed programme of what is called polytechnical education.[1] It should be pointed out that the term 'polytechnical' refers to a general basic technical education. In other countries, France being a prime example, 'polytechnical' refers to the highest engineering and scientific education. Because of the prominent place given to general technical education in the Soviet school system, wide provision is made for the preparation of teachers for these subjects.

As shown in Figure 4 (overleaf), children leaving the eight-year compulsory school have several options for continuing their education. If they have no intention of completing a secondary education,

1. See: S. G. Shapovalenko (ed.), *Polytechnical Education in the U.S.S.R.* (this series, III). Paris, Unesco. 1963, 433 p.; dossier of working papers for U.S.S.R./Unicef Seminar on Pre-vocational Training, Education and Vocational Orientation within and outside Schools, Moscow, 12–21 October 1970.

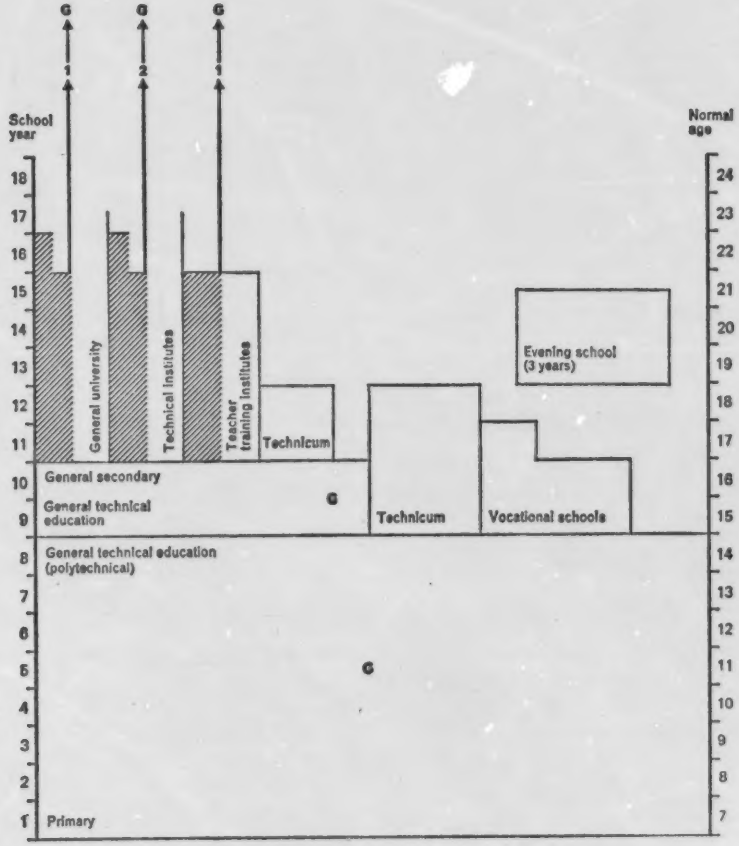


FIG. 4. U.S.S.R.: educational structure for general technical education and general technical teacher training.

they may go to a vocational and technical school for from one to three years to learn certain specific skills. Three types of institution provide a complete secondary education which permit graduates to continue study in a higher education establishment: the technicum or college, the general secondary polytechnical school, and the evening schools which allow students employed in industry or agriculture to complete their secondary education.

In both the eight-year primary school and the general secondary or polytechnical school, polytechnical education makes up a large percentage of the curriculum and is indeed compulsory. Based upon a concept of 'production technology', the practical aspects of the polytechnical course are taught in producing school factories. Among the goals of this type of education several stand out. It is designed to enable the child to relate school and life from an early age. Then too, it serves to give the child a clear understanding of the ramifications of modern technology by relating technology to all instruction, not only in general technical courses and in periods spent in the factories, but also in mathematics, science, literature and history. Another goal of the Soviet system which might be heeded by those countries with wide regional differences is to relate polytechnical education to the experience of the child or adolescent by adapting projects and syllabi to local conditions.

Teachers for the polytechnical courses are trained in university level institutions of one of three types: teacher training institutions, technical and agricultural institutions, and universities. The majority are prepared in one of two faculties attached to a teacher training institution: either a faculty of industrial pedagogy or a faculty of biology and agricultural production. To qualify for entry into the teacher education programme, candidates must have completed their secondary education and must also pass an entrance examination.

The teacher preparation course lasts five years. As may be seen from the curriculum in Appendix II.1, the course includes a number of general subjects, a wide range of technological subjects, and general and special pedagogy, as well as laboratory and practical work in schools and factories. Students are expected to achieve not only a certain level of theoretical knowledge but also a certain level of technical proficiency. The polytechnical courses they will eventually teach are designed to give students practical experience in production, in addition to a general technical background. Thus the polytechnical teacher must both be familiar with technical theory and workshop techniques and also have experience in actual production conditions, having achieved by graduation a

trade rating of joiner, turner, and metalworker. By far the largest portion of the curriculum is devoted to laboratory, seminar and practical work: of a total of 4,496 hours of study, only 1,776 hours are devoted to lectures and theoretical work.

Throughout the course, students take examinations and tests. In addition they must present several projects. For final qualification, four State examinations must be passed, two in technical subjects, one in pedagogy and one in political science.

The programme of teacher training for general technical courses in the U.S.S.R. is, then, rather rigorous. The thoroughness of the course is due quite naturally to the emphasis placed on polytechnical education throughout the school system.

Poland

Poland, like the U.S.S.R., has extensive provision for general technical education in both the primary and secondary schools.[1] Primary school teachers are trained in the centres for pedagogical studies, now two-year institutions, but which are projected to become three-year ones.[2] Teachers of general technical subjects in the secondary schools receive their education in the technical sections of the colleges of pedagogy. The course of four to five years' duration leads to the degree of *licence*. In order to enter the programme, students must have completed secondary education in either a general or a technical secondary school. The programme is designed to train neither engineers nor technicians, but rather to prepare teachers of general technical subjects. At present, there is a shortage of general technical teachers for the secondary schools and plans are therefore underway to institute correspondence courses at the colleges of pedagogy to prepare general technical teachers now teaching in the primary schools for teaching on the secondary level.

Australia

In Australia, where general technical education is given in the secondary school system, these programmes are conceived as part of a general curriculum that aims to bring students to a basic understanding of the principles and applications of modern technology and of its ramifications in a modern society. Pupils take courses in subject areas such as English, mathematics, science, social studies,

1. Poland, response to Unesco/ILO questionnaire.
2. See diagram of Poland's education system, p. 35.

music and art along with a range of theoretical and practical subjects in technical areas. The term 'pre-vocational' is generally used in Australia to distinguish this broad educational experience from the more specialized studies undertaken at senior-secondary and post-secondary levels.

The recruitment of teachers for general technical education reflects this conception of the purpose of 'pre-vocational' education. Teachers are usually trained in tertiary institutions of one of three types: universities, teachers' colleges and technical institutions. Courses vary in length from one to four years and include studies in teaching techniques, psychology, sociology and philosophy of education. Generally, trainee teachers are required to have completed secondary schooling and, in the case of trainees in the shorter non-university courses, to have acquired considerable industrial experience. Over the last few years, the policy that students preparing to teach at any level should follow a course of academic and professional studies of at least three years' duration has been adopted. Shorter courses are being phased out.

United States of America

General technical, or practical or industrial arts as it is known in the United States, has long been a required part of general education on the lower secondary level, and has long been available to upper secondary school pupils. 'Industrial arts' is a blanket term covering several basic areas: general technical drawing, general metalwork, general woodwork, general power mechanics (electricity, meters, vehicles), graphic arts and crafts. Many American educators argue that industrial arts is a necessary part of general education giving children not only certain basic notions as to the nature of technologies and how to work with tools and materials, but also serving other purposes as well, i.e., recreation, teaching the ways to distinguish between quality and shoddy products, and leading pupils to an understanding of industrial society and to the development of a proper attitude toward it.

Industrial arts teachers, as all primary and secondary teachers in most states, must have a tertiary education, that is, must have attended an institution of higher education, college or university, for four years and have achieved the bachelor's degree level, whether in arts, science or education. All states require a certain number of credits for pedagogical studies obtained on the basis of hours spent in courses in this field, the amount depending on the state. Occasionally teachers may be employed without the credits but must, within

a given length of time, acquire the necessary course credits in order to continue teaching. A number of universities scattered throughout the country have programmes which allow students to take a degree in industrial arts education. Students take the general subjects required by the university for graduation. A department of industrial arts education usually directs the special and pedagogical studies of the student having chosen industrial arts education as his major subject.

The State of California provides a good example of what is required and what is offered for industrial arts teacher education in the United States.[1]

Nine institutions of higher learning offer industrial arts education programmes which are accredited by the California State Department of Education for teacher certification. In all of these institutions, the programmes lead to a bachelor's degree in industrial arts education, and several offer programmes leading to the master's. All of these colleges and universities are institutions which fall into Pattern 1 (general institutions). Within the University of California, which has branches throughout the state, industrial arts education programmes are centred on one campus, that of Santa Barbara College.

Close co-operation with the State Education Department has assured that if students meet the requirements for graduation from one of these institutions, they are considered certified teachers. In all of these institutions, forty units of study, out of the approximately 108 units required for the degree, must be taken in industrial arts. All future teachers are required to take courses in five or six areas: drawing, wood, metal, electricity, graphic arts, auto. The remainder of the courses to make up the unit requirement in industrial arts are chosen by the student in his special field of interest. Furthermore, forty-five units of the total must be acquired in general education courses. The remainder of the total unit requirement of approximately twenty-three units must be in pedagogical courses for professional preparation. It should be noted that students are allowed to transfer credits from approved industrial arts programmes given in the two-year junior college.

France

In 1962, France instituted general technical courses in the first

1. California Industrial Arts Curriculum Committee, *Guide for Industrial Arts Education in California*, rev. ed., Sacramento, California State Department of Education, 1970, 39 p.

cycle of secondary school known as technical orientation courses.[1] Although the courses are not yet given in all schools and remain in the experimental stage, the French education authorities envisage replacing the experimental physics courses traditionally given in the first cycle, known as the cycle of orientation, by the technology courses. According to this plan experimental science would be reserved for the second cycle of technical education.

The problem of staffing the technical orientation courses, in France as elsewhere, has proved one of the largest stumbling-blocks to implementing the reform. Most of the teachers have been drawn from the ranks of employed mathematics and physics teachers in general education schools. Indeed, physics teachers at this level are greatly encouraged to make the switch as rapidly as possible given the plan to replace physics at this level with technology.

Teachers of technology are being prepared in six-month courses which include both pedagogical and technical studies. Industrial drawing is the most heavily emphasized subject in the technical area for it is considered that technical drawing is the language of technology as mathematics is the language of the applied sciences.

The six-month course is given in centres created especially to prepare teachers in the new field. These centres are attached to institutions which give instruction leading to the *certificat d'aptitude* for teaching in general education schools (*collèges d'enseignement général*). The preparation of technology teachers is given in co-operation with nearby technical *lycées* which provide laboratory facilities as well as technical teaching-staff for the programme.

In addition to the six-month course, a number of correspondence courses have been organized. Courses are also available through television. These, however, are considered as stop-gap measures until the full-time course may be better organized and available in more centres.

The establishment of the technical orientation course and the means of preparing teachers for these courses are far from being sufficiently organized. However, the French education authorities are convinced of the value of a basic technological education in the secondary modern schools, which resemble comprehensive schools, for a number of reasons. One of these reasons has been given in an official statement: 'Concerning orientation of the pupil, the technology course will release certain precious qualities in some children and will assure them a better education. It will contribute in particular to a better knowledge of and appreciation for technical activities

1. Information for this discussion of France was taken from government texts attached to the French response to the Unesco/ILO questionnaire.

and will thus facilitate an even distribution of pupils among the diverse branches of education.'

The French, then, conceive of technical orientation as serving both general education needs and of guiding toward technical education those pupils who have the ability to complete secondary schooling but who would have difficulty in finding employment if they remained in the general schools.

Israel

In Israel, basic technical courses are given in either the fifth to eighth grades or in the fifth to ninth grades.[1] Though known as crafts courses and incorporating general arts and crafts such as pottery, the courses also include an introduction to basic technological materials and procedures. The Israeli school system has in the past been organized with eight years of primary school followed by four of secondary school. This system is in the process of a changeover to six years of primary school, followed by six years of secondary school divided into upper and lower levels of three years each. With this reform, the government expects a greater demand for crafts teachers, and have changed the teacher preparation programme accordingly.

Crafts teachers are trained in special institutions under the authority of the Ministry of Education in two-year courses leading to a Craft Teacher Certificate. With the expected rise in numbers needed when the educational reform is completed, a third year has been added to the craft teachers' course leading to a Senior Craft Teacher Certificate. In order to enter the two-year programme, students must have had twelve years of schooling and hold either a school-leaving certificate from a secondary vocational school, or the matriculation certificate from an academic secondary school. Only those students entering with the partial matriculation will be allowed to continue the third-year programme. The object of this programme is to train a cadre of craft teachers with a wide academic and technical background to meet expanding educational needs. These teachers will be given higher salaries and priority in placement.

The two-year course is designed to train teachers in a wide variety of crafts as well as to further their general education and to provide

1. See Israeli response to Unesco/ILO questionnaire.

pedagogical training. Of a total of 2,280 lessons, 1,290 are devoted to technical and craft subjects, and 990 to general and pedagogical subjects. This programme is distinguished from those previously discussed in that there is more emphasis on certain traditional crafts with a more aesthetic bias. The curriculum for the craft courses as listed illustrates the wide variety of skills which the craft teacher is required to have. The general and pedagogical studies include the following subjects: psychology, philosophy and history of education, general teaching methods, hygiene, Hebrew, geography, sociology, Israeli culture, and specific crafts-teaching methods.

In the course of his studies, the future teacher is expected to achieve mastery of certain general areas with regard to each craft. These areas are: possible creative processes with materials listed in the syllabus, the specific characteristics of materials, construction methods and tools, design and function of the finished product, teaching and demonstration methods, and the organization of the workshop and its maintenance. The graduates of the course are expected to be able to reach certain pedagogical goals. They must be able to teach the basic technological know-how common to as many technical professions as possible; to give pupils a deeper understanding of the methods employed in the production of tools, accessories and objects used in everyday life; to encourage creativity and constructive work as well as proper work habits; to develop critical faculties for self-evaluation; and to encourage pupils' self-confidence in their talents and abilities.

Teacher certification is acquired upon successful performance on the general examinations at the end of the two-year course. The students take examinations in the general-subjects studies and a 4½-hour examination in five of seven crafts subjects. The crafts examination includes three hours of practical work and a 1½-hour period of written work concerning the teaching methods and aims appropriate to the crafts.

The curriculum for the third year is more technically oriented and includes more advanced pedagogical training. Upon completion of the course students must sit examinations in each subject. In addition, they are required to present a seminar paper.

The Israeli general technical teacher preparation programme trains a type of teacher somewhere in between the traditional handicraft teacher and the general technical teacher. The curriculum of the third year reflects the emphasis which will be given in the lower secondary level, grades seven to nine, to technology and industrial production.

CONCLUSIONS

The preceding discussion leads to the conclusion that what we have here called 'general technical education' has a number of different meanings at the present time. In the U.S.S.R., for example, polytechnical education assumes a position of primary importance in the general school curriculum, and great emphasis is given both in that education and in the preparation of teachers to the practical aspects of technological subjects. In France, on the other hand, 'technical orientation education' is considered more as a substitute for courses in the applied sciences, and therefore the bias is more theoretical. In Israel, yet another variation occurs in that this type of education is more coloured by an aesthetic bias, as the term 'craft studies' indicates. Yet in all cases there is a trend toward considering some form of elementary technology with an interdisciplinary approach as a necessary and proper component of the required lower secondary curriculum.

All of the countries presented here to illustrate typical patterns of preparation are concerned with developing appropriate teacher preparation programmes for this type of education which is quite different in objectives from technical and vocational education proper. This may be considered to be a general trend in most industrialized countries.

A few generalizations may be made as to patterns of recruitment and programme form and content. Future general technical teachers are usually recruited from those having completed secondary education who enrol immediately in integrated programmes in tertiary institutions. In a number of countries the institutions which offer programmes to prepare general technical teachers are institutions for general teacher training. As was pointed out in the introduction to this pattern of preparation, it provides a number of advantages, since these teachers will be teaching in the general schools and should furthermore be prepared to relate their subject to other subjects in the required curriculum. The sanction for these studies is, or is tending to be, the first university level degree awarded in a given country.

France offers an exception to these generalizations. In the first place, general technical teachers are recruited from the ranks of employed physics or mathematics teachers. The preparation programme is, as a consequence, different. Rather than being a lengthy integrated programme, it emphasizes a technical approach and teaching methods appropriate to technical subjects. Israel too offers an exception in that craft teachers are trained in specialized institutions rather than in general teacher preparation institutions.

It should be noted that generally no industrial experience is required outside the practical work in the teacher preparation programme. Australia is an exception, because some teachers are recruited from qualified workers or technicians with considerable experience, and given brief pedagogical courses. This method of recruitment and training is, however, being phased out. Furthermore, in this context the U.S.S.R. is an exception in that, as a result of the programme, future general technical teachers achieve recognized qualification as a skilled worker or technician.

In the foregoing discussion, three types of programme have then been illustrated: the integrated programme of three to five years' duration, the pedagogical programme for teachers recruited from employment, and a combined technical and pedagogical programme designed to convert teachers of mathematics and sciences to teachers of general technical subjects. From past experience and current thinking on the subject, the first type of programme seems to be the most appropriate, both in terms of form and content, for the preparation of general technical teachers. The second type, is, however, useful for immediate solutions to teacher shortage in this field.

Examples of fairly well-developed general technical teacher preparation programmes have been adduced. But in many countries this type of teacher preparation is either of recent origin or is in the experimental stage. The common feature of most importance, however, is that general technical education is an area of concern and one in which rapid changes are being made. Industrialized countries have recognized the democratizing effect of this type of education as well as its value for orienting capable students toward technical and vocational education.

GENERAL TECHNICAL TEACHER PREPARATION IN DEVELOPING COUNTRIES

Developing as well as industrialized countries are coming to recognize the great value to them of some form of general technical education. In the introduction to this chapter, we pointed to some of the reasons why this form of education should be heartily supported in developing areas. In addition to the democratizing of what are often rather élitist education systems, general technical education may be seen as the starting-point for an educational process which would contribute to the creation of the pool of technical manpower necessary for economic and industrial development.

A number of factors retard the rapid institution of general technical education in developing countries, which though inhibiting in industrialized countries, are nevertheless of greater magnitude in developing ones. Among these factors are the difficulty of changing a traditional education system, the cost of so doing, and the recruitment and training of staff. Despite these difficulties, steps have been taken in a number of developing countries, ranging from initial investigation of the problem to the actual implementation of courses and of programmes for teacher training.

The development of general technical teacher programmes may well prove an ideal starting-point for the development of vocational and technical teacher training programmes. As will be seen in the following chapter, one of the programmes offered in the Technical Department of the Teachers Training College in Singapore at the time of its expansion in 1969 was a two-year part-time one leading to qualification as an industrial arts teacher. This crash programme was designed to retrain general subjects teachers to teach technical subjects on the lower secondary level. On the basis of this programme, which has since been dropped in favour of full-time courses, further programmes have been developed leading to a Certificate in Technical Education and a Bachelor of Education (Technical). The general technical teacher may be initially trained in a much shorter period than either the technical or the vocational teacher. His role does not necessarily call for professional technical qualification, therefore larger numbers are available for recruitment. Furthermore, less-expensive, less-complex laboratory and workshop facilities are needed. Although it is feasible to train general technical teachers in relatively brief crash programmes, this should be seen as an emergency measure designed to introduce general technical education into the schools as rapidly as possible. Concurrently with the introduction of crash programmes, more thorough programmes should be developed in order to meet future needs.

In the following section we will look at evidence of how Sri Lanka has taken initial steps toward the introduction of general technical courses and teacher preparation programmes. We will also discuss programmes in the process of implementation in three countries—Zaire, a less developed area of Yugoslavia, and Nigeria.

Sri Lanka

In 1967, Ceylon drew up a preliminary study of existing practice in general technical and vocational education in the country with a

view to asking aid from Unicef for further development in this area.[1] This report provided a table of statistics which well illustrates the need for general technical education in Sri Lanka. This example may be taken as typical in many developing countries. Table 1, although outdated, shows a high unemployment rate for those with general secondary and even higher education.

TABLE 1. Percentage of involuntarily unemployed by educational status (Sri Lanka)

Category	1953	1963
No schooling	16.6	6.0
Some primary	16.4	10.5
Some secondary	17.9	23.0
Passed G.C.E.	25.0	39.3
Some higher education	2.9	13.9
Technically educated	—	3.8

The unemployment rate for those having completed a general secondary education was extremely high. Some means must be found to channel more secondary school students into areas of study which will lead to employment and growth of the economy. Sri Lanka has come to the conclusion that greater emphasis on technical education will help solve the problem.

Some form of technical education is now available in all grades. In the first five grades, children do some craft work. In grades seven and eight, what is called work education is now required, taking up some 20 per cent of the curriculum according to a government reform in 1967. This regulation has yet to be fully implemented in all schools, however. In the last four years of secondary school courses in what is called the practical arts are available as an elective. Practical arts is the general label for courses which include, among others, industrial arts and agricultural arts. Sri Lanka legislation, then, provides for general technical courses throughout the general school system, courses which are clearly distinguished from industrial education or vocational education.

There are several major barriers to fully implementing the programmes in work education on the lower secondary level and

1. Dr Casimiro E. Maningas, *A Preliminary Study of Work Education Programmes in Post-primary Schools (grades VI–VIII), Practical Arts in General Secondary School and of Vocational Education in Junior Technical Schools conducted for the purpose of Formulating Recommendations for the Development of possible projects in which Unicef may participate*, Colombo, Ceylon, Ministry of Education, 15 March to 13 May 1967, 67 p.

practical arts education on the secondary level. These include a lack of enthusiasm on the part of both parents and students for technical education, lack of proper workshop facilities, and lack of qualified teaching-staff.

Teachers are now prepared for all grades of primary school, from one to eight, in two-year courses with roughly only 10 per cent of the curriculum devoted to craft training. Whereas this may be appropriate for teachers of the first five grades, it is decidedly inadequate for teachers in the upper primary and lower secondary grades, that is, grades six to eight. The government therefore has recommended that facilities at teacher training institutions be created to extend the programme to three or more years, providing more content training in work education.

Teachers in the practical arts courses on the lower secondary level are at present trained in teachers' colleges in two years. The course includes general, pedagogical and handicraft subjects. As in the case of the upper primary teachers, this training is not considered adequate. The government therefore wishes to establish a Teacher Education Department, either agricultural or industrial, in connexion with a college or technical school. This department would be designed to prepare teachers of work education for the upper primary grades and teachers of practical arts in the secondary schools as well as vocational teachers. Steps have been taken to create such an institution in an ILO/UNDP project in which Unesco participates. A Technical Teacher and Instructor Training Institute has been created on the Technological Campus of the University of Sri Lanka. Courses began in the institution in September 1971. Although the institute is not yet in full operation, it is planned that the facilities will eventually be used to train general technical teachers for the lower secondary or middle schools (grades six to nine).

Zaire

The report of a seminar held in Dakar under the aegis of Unesco in 1970[1] gives ample evidence of the interest in general technical education and teacher preparation in the francophone States south of the Sahara. All of the problems involved in introducing such courses and staffing them were discussed at length. One of the major problems, it was agreed, was overcoming the prejudice against

1. Unesco Regional Office for Education in Africa (Dakar, Republic of Senegal), *The Introduction of Technology into General Secondary Education in Africa South of the Sahara*. Dakar, 23 June to 11 July 1970.

technology existing in these societies. In several of the countries represented at the conference, general technical teacher preparation programmes have been instituted, deriving their inspiration from France. In Mauritania, for example, a course in technology is now required at one of the 'normal' schools training primary teachers with a view to the future institution of general technical courses on the primary level. Zaire, whose educational system is similar to the French, has instituted an orientation cycle on the lower secondary level in which technical studies are given as a part of the general education. The country has one completely functioning programme of teacher preparation for these courses.

The programme for training general technical teachers has been instituted in a pilot teacher training school on the intermediate level (*école normale moyenne pilote*) under the authority of the Institut National de Pédagogie. The programme, of three years' duration, leads to teacher qualification in mathematics and technology. These teachers teach the technology courses in the first two years of secondary school, mathematics in the first four years, and physics in the third and fourth years. In order to qualify for entrance to the programme, candidates must have the State diploma of completion of secondary studies.

Graduates of the programme receive a diploma and may, if they so desire, go on to the École Normale Supérieure which leads to the *licence* and to teaching in the upper secondary cycles. There is no technology option in this institution.

The curriculum emphasizes mathematics and physics but requires a considerable amount of technology as well. The theoretical pedagogical courses are given in the second year. Most of the third year is devoted to a five-month period of practice teaching; a written thesis must be presented that year.

Yugoslavia

One region of Yugoslavia is less developed in comparison with the rest of the country—Kosovo Province. A Unicef project in the province, one of many such now in progress, has provided funds for developing technical education and its has been suggested that some of these funds be used for general technical teacher preparation.[1]

Since 1959, technical education has been a required part of general education in Yugoslavia. In grades one to three, it is an integral part of the general curriculum. In grades four to eight it is

1. See the report of the joint Unicef/WHO/Unesco evaluation mission on the Unicef project, *Integrated Services for Mother and Children*, Kosovo (Yugoslavia).

treated as a required but special subject area. For the lower primary grades, teachers are prepared in special institutions on the upper secondary level. For grades five to eight, teachers must have a diploma from a higher teacher training institution.

Kosovo up to the present has not offered a full primary education up to the eighth grade in all of its schools, so only a relatively small percentage of students are able to complete primary school. Furthermore, the facilities for general technical education are inadequate and the schools are poorly staffed.

The Higher Teacher Training College in Pristina is the one institution in the province which prepares general technical teachers for grades five to eight. Candidates for the two-year course must have completed secondary education for entrance. The curriculum is primarily technical and pedagogical.

Although students are required to have six days per year of practical experience in industry, this is not considered sufficient, especially in view of the lack of adequate workshop facilities at the college. As one solution to this problem (which might be considered in other countries encountering the same problem in providing practical technical experience in their teacher preparation programmes), a Unesco evaluating mission has recommended that Unicef funds be used to create a 'production unit' attached to the college. This workshop would be a producing factory manufacturing, for instance, equipment for use in primary school workshops. Prospective teachers would then be required to spend six months in the unit after completion of their studies.[1]

Nigeria

Nigeria, as we have seen in the preceding chapter, has for the last decade recognized the importance of developing technical education. With the aid of IBRD, 920 workshops have been built for the comprehensive schools, and a new building for the National Technical Teachers College is under construction. But in the course of implementing programmes, including teacher training, Nigeria has been plagued by the classical problems facing developing countries in this area of education, among them providing teachers for the schools and staffing teacher training institutions. As was pointed out, the original Unesco/UNDP project for establishing a technical teachers' college at Lagos made no provision for the training of general technical teachers. In 1969, the goals of the project were changed and now a three-year course is offered in a

1. See Chapter VII for a more detailed discussion of production units.

special department of the college specifically preparing general technical teachers for the lower secondary comprehensive schools.

Candidates for entrance to the course at the National Technical Teachers College must possess the West African School Certificate (Science Stream) awarded after completion of secondary school. At the end of the three-year course, successful students are awarded the Nigerian Certificate of Education (Technical).

The course, as may be seen from the curriculum in Appendix II.2, is general, pedagogical and technical. Greatest emphasis is placed upon workshop and pedagogical courses. Students must take either metalwork or woodwork as their major subjects. This decision is made in the second year after having taken both throughout the first two years along with some instruction in automotive and electrical engineering and the building trades. Graduates of the programme then have a general background in the basic areas, as well as specialized training in an associated range of crafts. Another noteworthy feature of the programme is the large percentage of the theoretical pedagogical studies devoted to teaching methods, the use of audio-visual aids and the organization of teaching materials.

By emphasizing the preparation of general technical teachers in the National Technical Teachers College, it is hoped that a step toward the solution of some of the basic problems in technical education will have been taken. As more and more students go to comprehensive schools for their secondary education rather than to grammar schools, the general technical courses may well result in more students being guided into further vocational and technical education. The first step towards implementing this change is quite naturally to prepare teachers for the new type of general education which includes technical studies.

CONCLUSION

A number of developing countries are, then, beginning programmes of general technical teacher preparation with a view to expanding general technical education in the general education schools. On the whole, these programmes are, at present, less lengthy than those in developed countries. But developing countries are in the process of extending their programmes to reach a level at which they may be sanctioned by a first university award. In developing countries, contrary to the situation in developed nations, general technical teacher preparation programmes are more likely to be offered in specialized technical teacher training institutions or pedagogical

departments attached to technical institutions, as the cases of Singapore and Nigeria illustrate. Although it might be preferable that these teachers be trained with teachers of general subjects, i.e. in general teacher preparation institutions, there are nevertheless certain advantages to developing countries of preparing these teachers in specialized technical teacher institutions. For a general technical teacher programme is in a number of ways less difficult to initiate in a situation of limited resources. It is, for example, easier to recruit general technical teachers than technical or vocational teachers, because students may be taken directly after completion of secondary education. Furthermore, employment experience in the technical field, while desirable, is not as urgent a requirement for general technical teachers as for other categories of technical and vocational teachers. As a result, there is on the one hand less danger of losing teachers to more lucrative employment, and on the other, the preparation programme in general may be of shorter duration. Also the workshop facilities for general technical teachers need not be so complete and therefore are less expensive. For these reasons, a country wishing to establish institutions specializing in the preparation of technical and vocational teachers could well begin a technical teacher training college with an integrated programme for general technical teachers. On the basis of this programme, expansion may be undertaken as sources of recruitment and finances permit.

SUMMARY AND CONCLUSIONS

The various programmes for the preparation of general technical teachers discussed in this chapter may be considered typical examples of how these teachers may be trained and what constitutes a normal programme of studies. On the other hand, numerous countries, both developed and developing, which are beginning to introduce general technical studies into the general schools, have yet to fully implement teacher preparation programmes. This is, then, a field which is in the experimental stages in many countries, and in which much remains to be done.

The way in which general technical teachers are prepared depends largely on the concept of the nature and function of general technical studies in any given society. Where a general technical education is seen to be a necessary part of every child's general education, and where it includes the relation of technology to wider

social and economic questions, as in the case of the United States and the U.S.S.R., wider provision for teacher training exists and rather lengthy comprehensive programmes of study have been created especially for this field. Where such education is seen as an alternative to traditional science, as in France, and where it serves primarily an orienting purpose, teacher preparation emphasizes the theoretical technical and scientific aspects. Where goals of such education are to provide an adolescent with certain basic skills which render him more employable, there is a consequent emphasis on the practical training of the future teacher.

Despite the diversity of the programmes discussed, certain common features may be distinguished. In most cases, entrants into general technical teacher preparation programmes are required to have completed secondary education. The programmes themselves are usually comprehensive in nature, that is they include further general education, technical studies and workshop practice, and courses in pedagogical principles and methods as well as a required period of practice teaching. Furthermore, these programmes either are on, or are tending toward, a level equivalent to that for teachers of general subjects. The sanction for these studies then either is or is tending toward an award of university status, e.g. a bachelor's degree or a *licence*.

The institution of general technical programmes in developing countries is of very recent origin and programmes for teacher preparation are just now getting under way. These programmes should be highly encouraged, for this type of education and the quality of teachers staffing the general technical programmes may well be the key to the future technical and economic progress of developing areas.

It is generally recognized that special teacher preparation for general technical education is necessary. The general subjects teacher does not have the requisite technical background; the technical or vocational teacher is too specialized. Much further research and experimentation is necessary to create a teacher equipped to impart a kind of general technical education approaching the ideal on the lower secondary level. For this teacher should have a broad general education and an understanding of the role of technology in the modern world, as well as competence in several technical fields and the ability to relate these fields one to another in effective presentation to his students. It is also of great importance that the preparation of these teachers be on the same academic level as that of their colleagues in general education in order that general technical studies command the respect necessary for their success.

Some exposure to technology should be part of the cultural baggage of schoolchildren and young adolescents, whether or not they work later in a technical field. Thus even more attention should be given, in both industrialized and developing countries, to the preparation of teachers for this vital area of modern education.

CHAPTER IV

VOCATIONAL AND WORKSHOP TEACHER EDUCATION

Vocational and workshop teachers are a key element in any system of technical and vocational education. In many countries, more than half of the secondary school population are engaged in some form of vocational education, and where this is not the case, governments are taking measures to assure that these facilities will be available. Vocational and workshop teachers are thus responsible not only for a large proportion of their countries' secondary pupils, but also for the education and training of that group which is the foundation of an expanding modern economy—skilled workers, and in many cases, ordinary technicians.

The job of the vocational and workshop teacher extends far beyond the mere transmission of specialized skills in order to render adolescents employable. Vocational education has broader aims. The young worker receives training in his speciality on the job, either in industry or through apprenticeship agreements, but this training can not assure him professional mobility nor give him a foundation for continued education. Education is necessary if skilled manpower is to be retrainable should the need arise, and if individuals are to be equipped to take advantage of opportunities for professional advancement. Jobs are not lost through skills but through lack of adaptability to a changing situation. Thus some form of vocational education should be compulsory, either full-time or part-time, in order to provide workers and ordinary technicians with the general education necessary to personal development, and with the theory and practice of the vocation which complements the more specialized on-the-job training. Furthermore, vocational education is not simply limited to industrial and trades education but includes a broad range of occupational activities such as business and commercial, catering, agriculture, health, transport, and the service trades which are becoming an increasingly important sector. If vocational education in the schools is to fulfil these objectives well-qualified and properly trained teachers in all these fields are essential.

The preparation of vocational and workshop teachers has in the past tended to be rather more haphazard in terms of formal education than that of the theoretical technical teacher. For one of the necessary prerequisites for the vocational teacher, as well as for the workshop teacher, is a thorough knowledge of, and experience in, the special occupational field. In the past, these two categories of teachers have for the most part been recruited directly from employment, often have had little pedagogical training and have lacuna in their general education. As programmes are being developed for the training of these teachers at the tertiary level, educators have been faced with two important problems: how to provide employment experience for vocational teachers and how to provide a higher level of general education for the workshop teacher. Vocational and workshop teachers link occupations and education: it is through these teachers that large numbers of students will or will not be prepared to be productive members of modern society, and will or will not be prepared to meet the challenges of life humanely and intelligently.

Often it is difficult to define precisely the vocational teacher and the workshop teacher. Indeed, some countries make no distinction between the two. In addition, the range of qualification existing for these categories, the frequent overlap in duties, and the equally frequent lack of distinction between the vocational and the technical teacher render precise definition difficult and somewhat arbitrary. Nevertheless the definitions given in Chapter I may be said to obtain generally. The vocational teacher teaches trade and technical theory in secondary full-time or part-time vocational schools or in the vocational streams of comprehensive schools whose programmes are designed to educate skilled workers and ordinary technicians. The workshop teacher is responsible for the practical training of students in comparable schools. Although most of the case studies used in this chapter concern teachers of trades, crafts and industrial subjects, it should be kept in mind that teachers of commercial subjects, teachers of vocational agriculture and of home economics among others are also a part of the categories of vocational teachers and workshop teachers. To further illustrate the ambiguity of the situation, the vocational teacher may teach both theory and practice, and many arguments may be adduced as to the desirability of preparing this type of teacher. Also, he may have the same training and qualifications as a technical teacher and therefore teach theory on a relatively advanced level or he may have had a primarily practical training qualifying him as a workshop teacher in a higher technical institution. The workshop teacher on the

other hand may teach theory on the lower levels, as well as workshop practice. Also, the vocational teacher may teach one specialized subject (monovalent) or he may teach a variety of subjects related to his field (polyvalent). What he teaches and, therefore, how he is trained, clearly depend upon the structure of a given secondary and vocational education system.

There is at present great variety in the qualifications accepted or considered appropriate for vocational teachers. The vocational teacher may have a university degree in his field; he may have a technical education degree or diploma; he may simply have technical qualifications and have taken in-service pedagogical courses for teacher qualification; or he may have no teacher qualification at all. The workshop teacher in virtually all cases possesses technical or trade qualifications and has had extensive experience in employment in his special field. But he may have a pedagogical certificate, or he may have taken in-service courses which do not lead to certification, or he may have had no pedagogical training at all—which is the more usual case. Unesco, ILO and the Council of Europe have made recommendations as to the appropriate qualifications.[1] All agree that the vocational teacher should have a degree or higher diploma in his field and should have had industrial or comparable experience. For workshop teachers it is agreed that the major qualification is competence in the field of specialization achieved through training and practical experience. Unesco, however, places more emphasis on the level of general education necessary for an effective workshop teacher. For both categories of teachers, Unesco and ILO highly recommend some form of pedagogical training, both theoretical and practical, in order that teachers be better able to transmit skills and knowledge.

Once standards of qualification are agreed upon, the next problem is how to construct teacher education programmes to achieve the desired level. In general, both the vocational teacher and the workshop teacher should receive an adequate general education, theoretical and practical training in their field, and pedagogical training, both theoretical and practical. The quantity of time devoted to the teaching of these areas in the programme will, of course, depend on the qualifications of the future teacher at entrance into the programme. If he has a degree or higher diploma in his field, his teacher training will be purely pedagogical and some

1. See: Unesco, *Recommendation concerning Technical and Vocational Education;* ILO, *Recommendation concerning Vocational Training* adopted by the International Labour Conference at its forty-sixth session on 27 June 1962; Council of Europe, Committee for General and Technical Education, *Training and further Training of Teachers in Technical Schools* (1970).

provision for industrial experience should be made. If he enters the programme after a certain amount of experience in industry, again the emphasis of his training will be pedagogical and often he will require further general education. If he enters a programme directly from secondary school, a formula will have to be found which will give him the proper education in all three areas.

In the discussion that follows, the types of programmes—existing and projected—for the education and training of vocational teachers and workshop teachers will be considered. Before proceeding to a more detailed analysis, however, some general remarks on the recruitment of these two categories of teacher and the problems involved are in order.

Vocational and workshop teachers are usually recruited from one of three groups: well-qualified workers and technicians in employment, secondary technical or general school-leavers, or teachers of general subjects, usually of basic science or mathematics who, through in-service courses, are converted to vocational teachers. Recruits from each group will bring special qualities to teaching. Those from industry might be better equipped to gear their instruction to students who tend to view the world in concrete and practical terms and to relate industry and education. The young person, who, at 18 or 19, chooses a career as a vocational teacher and pursues an integrated course of studies preparing him for this role, will have received a far more systematic training and will be prepared to impart his knowledge in a more professional way. The 'converted' teacher will bring a broader view to his subject and will probably be better prepared to relate specifically vocational subjects to other areas of knowledge.

The recruitment of vocational and workshop teachers poses a number of problems, for the supply of recruits is simply not adequate to meet the demand, in industrialized as well as developing countries. It is most difficult, for example, to attract competent technicians and workers from employment into the teaching profession. In all countries not only is the pay far better in industry, but the prospective teacher will lose valuable time and money while pursuing his teacher training. The fact that future teachers in this category are likely to be married and supporting families does not improve the situation. Again, because career prospects are not as attractive in vocational education as in industry, it is difficult to draw large numbers of secondary school leavers into teacher education programmes. In the case of converting the general teacher, other difficulties are encountered: he usually has more prestige stemming from the traditional educational structure as a teacher of physics

than as a teacher of theoretical vocational subjects in a vocational school. A major step necessary to solve the problem of recruitment, then, is upgrading the status as well as the salaries of vocational and workshop teachers. Until this is done, the problem of finding competent students for teacher preparation programmes will remain.

In addition to the general problems of recruitment, developing countries have others as well. One of the primary problems is the shortage of skilled manpower. Those who are trained are direly needed for developing industry, trade and commerce and few can be spared to teach even if the teaching profession were made more attractive. Thus a vicious circle is created whereby trained manpower shortages render recruitment for teaching difficult and the shortage of qualified teachers further contributes to the lack of trained manpower.

Enormous problems arise at every stage in the training of qualified vocational and workshop teachers. Standards of qualifications must be set, programmes geared to the needs of various groups of recruits developed, and the status and pay of vocational and workshop teachers raised. This task is a vital one, particularly for developing countries. For it is through competent vocational teaching on the secondary level that they will create the basic pool of skilled workers and ordinary technicians in various sectors necessary for economic development and expansion.

In this chapter we will look first at vocational teacher education and then at workshop teacher education. In each section, cases of existing programmes and institutions will be cited and qualifications, recruitment norms and curriculum content discussed. The question of in-service training or upgrading will be left to a later chapter.

VOCATIONAL TEACHER EDUCATION

Vocational teachers are usually prepared in one of the two general types of programme distinguished in this study: integrated or comprehensive programmes and strictly pedagogical ones. The first type of programme is designed especially for secondary school leavers who enter directly into a teacher preparation institution. The programme, on an average four years in length, furthers the general education of the prospective teacher, trains him in the theory and practice of his special field, and provides him with a foundation in the theory and practice of teaching. Strictly

pedagogical training for future teachers having already achieved competence in their field is given in a variety of courses ranging from several months to two years in length. Different courses of this second type are designed to meet the needs of several kinds of prospective teacher: those just out of university or a higher educational institution, those who have a degree or diploma and some experience in industry, or those coming from employment with good technical qualifications not necessarily obtained in a formal programme of higher learning.

Of all the categories of teacher discussed in this study perhaps the largest variety in qualifications is to be found among vocational teachers. The vocational teacher may have a university degree or diploma from an institution of higher learning; he may possess a certificate or diploma from a post-secondary technical institution; or he may have a diploma or certificate from a secondary or advanced secondary institution. On the first level of qualification he is scarcely distinguishable from the technical teacher, on the last from the workshop teacher. Wide variations in terms of employment experience characterize the vocational teacher as well, the amount of experience usually dependent upon the group from which the future teacher is recruited.

VOCATIONAL TEACHER EDUCATION IN INDUSTRIALIZED COUNTRIES

The experience of the Federal Republic of Germany provides a good example of an integrated programme, those of Australia, Finland and Belgium of the primarily pedagogical courses.

Integrated Programmes

Federal Republic of Germany

A system of integrated studies for vocational teacher preparation obtains in the Federal Republic of Germany.[1] As state (*Land*) authorities are responsible for education, the entry requirements and the curricula vary from state to state, though the general character of vocational teacher training remains roughly the same. Vocational teacher preparation takes from four and a half to six years to complete, including eighteen to twenty-four months'

1. See: ILO, *Training of Vocational Teachers*, CIRF Monograph No. 1, Geneva, ILO, 1969; Federal Republic of Germany, reply to Unesco/ILO questionnaire; and Federal Republic of Germany, reply to questionnaire on draft.

practice teaching. Also, the vocational teacher must be polyvalent and teach general subjects (German, civics) as well.

The vocational teacher in the Federal Republic of Germany is trained to teach in the following types of schools: part-time compulsory vocational schools (*Berufsschulen*), full-time vocational schools (*Berufsfachschulen*), vocational promotion schools (*Berufsaufbauschulen*), technical colleges (*Fachoberschulen, Fachgymnasia*) and technical schools of rurther vocational training (*Fachschulen*). The part-time vocational schools are designed to further the general and theoretical and practical technical education of apprentices for whose on-the-job training the employer (industry, crafts, the civil service, etc.) is entirely responsible and who constitute the vast majority—about 90 per cent—of all young persons undergoing training to become skilled workers, journeymen or clerks. The full-time vocational schools provide for theoretical as well as for practical training. The vocational promotion schools lead to the *Fachschulreife*, the entrance qualification for technical colleges and technical schools of further vocational training, which in turn lead to entrance qualification (*Fachhochschulreife, Hochschulreife*) for studies on the university level. In the older forms of vocational education, usually one teacher is responsible for one class and teaches all general and technical subjects to it. The present trend, however, is more and more to employ specialized subject teachers. This is already accomplished in the full-time vocational and secondary and other technical schools and is now being introduced also in the part-time vocational schools.

Vocational teachers are nowadays almost exclusively trained at general or technical universities or in special university-level institutions not necessarily a part of a university. Entrants into vocational teacher preparation are usually 20 to 21 years of age and have had from six to eighteen months of experience in industry. Candidates must normally have passed the senior secondary school leaving examination. Most vocational teacher preparation programmes also accept graduates of state colleges for higher technician training who have obtained a ministry of education certificate qualifying them for university entrance.

To become a qualified vocational teacher requires a total of six to seven years, the duration varying from one state to the other. This period is divided approximately as follows: six to eighteen months of practical work in appropriate undertakings, before and during teacher training, three to four years of academic studies at a general or technical university, and eighteen to twenty-four months of practice teaching in a post-graduate course.

A part of the prescribed period of practical work has to be obtained before starting teacher training, the remainder during the holiday periods between semesters. This part of the practical work experience is guided and supervised by a special institute. Full apprenticeship or completed initial training, with the relevant final examination, is normally accepted in lieu of the prescribed work experience.

The academic programme covers three major fields: pedagogical sciences, technology, and economics and social sciences. The share of each of these fields in the total programme varies considerably at the different universities. The pedagogical courses include such subjects as general and vocational pedagogics, psychology, philosophy, and general and special didactics. Technology constitutes the main field of study since it covers the subjects which form the major part of instruction given at a vocational school. The student teacher can usually choose one of a number of technical subjects according to his choice of a line of specialization and to his practical work experience. As for the economic and social sciences, student teachers are required to choose one or more subjects, such as civics, history, geography, economics, languages, mathematics, or sciences.

Armed with a goodly amount of trade experience and his academic knowledge, the student begins his period of practice teaching in a post-graduate course which lasts between eighteen and twenty-four months. During this period the student teacher's time is divided between observation and supervised teaching practice and attendance at lectures and seminar discussions.

At the end of the academic period the student teacher must pass the first state examination. Requirements normally include a pass in one or several written and oral examinations and the submission of one or more papers on a special subject of study and/or an educational problem. Final qualification is obtained through passing the second state examination at the end of the post-graduate course. This examination generally includes the submission of a thesis on a special subject, an oral examination and an assessment of the candidate's teaching performance.

The system of vocational teacher training in the Federal Republic of Germany is, then, a rigorous one. The programme is characterized by the emphasis in the academic course on general and theoretical subjects. The preparation of vocational teachers resembles that of technical teachers in most other countries. Indeed, it is envisaged that in the future there will be only two categories of teachers for technical and vocational education—teachers of theory and teachers of practice. Although during the academic course the

prospective teacher follows an integrated programme in that he takes general, technical and pedagogical subjects concurrently, this theoretical education is quite separate from his practical training in his trade and in teaching. On the one hand, it could be argued that the separation between theory and practice is too great and that the preparation is too academic in nature. On the other, it could be argued that the programme is designed to create a vocational teacher with breadth of knowledge and view, possessing a spirit of synthesis.

Pedagogical Courses

Two examples of institutions offering primarily pedagogical training for candidates already possessing the appropriate technical qualifications were referred to in Chapter II: ENNA in France and the colleges of education (technical), in the United Kingdom.

The Technical Teachers College, State of Victoria, Australia, the Technical Normal Schools in Belgium and the Vocational Teacher Training Institute in Finland provide further examples of institutions designed for the pedagogical education and training of future vocational teachers.

In all three cases, those completing the programmes have a lower level of formal education than those in the Federal Republic of Germany. The institutions are tertiary level but are post-secondary rather than university institutions. In all cases the appropriate technical qualifications and experience are required before the candidate may enter the teacher training programme.

Australia

In Australia there is no distinction made between the technical and the vocational teacher.[1] The Technical Teachers College in Victoria prepares vocational teachers of technical subjects, as well as of the theory and practice of general technical and trade-related subjects in the junior and senior sections of technical schools.

Candidates for the technical teachers' courses must possess a diploma from a four-year technical college (entry to which requires a secondary leaving certificate, general or technical) plus two years' industrial experience.

The course at the Technical Teachers College lasts one academic year. The student teacher spends approximately half of his time each

1. Information on the Technical Teachers College in Victoria was taken from Australia's response to the Unesco/ILO questionnaire.

week teaching in a technical school and the other half taking courses at the college. At the end of the year, he is examined in the various subjects; if successful, he receives the Trained Technical Teachers' Certificate.

Belgium

In Belgium, the programme for preparing vocational teachers lasts two years.[1] This preparation is given in two ways. The vocational teachers' colleges (*écoles normales techniques moyennes*), either public or private, are responsible for the preparation of home economics and commerce teachers and teachers of mechanics, electricity and woodwork.[2]

The courses in the teachers' colleges are integrated since future teachers must take courses in their special field as they have not yet attained full professional qualification. More usually, vocational teachers obtain their qualifications through the *cours techniques normaux moyens*—part-time teacher preparation courses, given by specialized technical institutions. Although some general education courses are required, the emphasis is on pedagogical studies.

The vocational teacher in Belgium is prepared to teach technical theory, technology, or trade practice in one of the parallel streams of vocational education. He may teach in either the trade schools (*écoles professionnelles*) which train semi-skilled workers, or in the lower two cycles in the technical schools (*écoles techniques*), the first of which trains skilled workers, the second, ordinary technicians, or in part-time education.

In order to qualify for entrance to a vocational teachers' school, a candidate must have either a higher secondary school leaving certificate or a lower secondary school certificate and three years of experience in industry. Persons with the first qualifications are more likely eventually to teach theory; those with the second to teach trade practice. These studies are sanctioned by a special diploma for teaching on the lower secondary level (*agrégation de l'enseignement secondaire inférieure*). Entrance to the *cours techniques normaux moyens*, which are primarily pedagogical in nature, is based on qualifications in the special field. The programme of the part-time courses emphasizes pedagogical studies. Although the student takes general subject courses, these are considered to be simply a complement to the knowledge and general culture already acquired. The courses

1. See Belgium's reply to Unesco/ILO questionnaire.
2. The programme in the vocational teachers' colleges for teachers of mechanics, electricity and woodwork remains in the experimental stage.

at the teachers' colleges are integrated with considerable emphasis on the theory and practice of the special field. The areas covered in both programmes includes pedagogy, psychology, methodology (both general and special), and didactic experience. The students do not have a period of practice teaching within a school, though they are occasionally responsible as a group for a lesson in an apprentice workshop. Rather, practical training is given in the form of sample lessons, seminars and lessons presented by the student before a group and then discussed.

Upon completion of the programme in the *cours normaux*, the student who has been positively evaluated by his professors receives a certificate of completion of the course. This certificate does not, however, qualify him fully for employment as a vocational teacher. At the time of his final examination, he must prove that he has a certain amount of recognized practical experience either in the practice of his trade or in teaching. Trade practice teachers throughout the vocational education system must have at least three years' recognized practical experience. Teachers in the trade schools or on the lower level of the vocational schools must have at least two years' experience and those in the trade continuation schools or in the middle form of the vocational schools must have three years' experience.

Finland

A third example of vocational teacher preparation in a strictly pedagogical programme is to be found in Finland.[1] There is one vocational teacher training institution at Hämeenlinna which provides a one-year pedagogical course for both vocational and workshop teachers. Whether a student becomes a vocational teacher primarily of theory or a workshop teacher of practice depends on the qualification he has at entry into the programme. Vocational teachers are prepared in this institution to teach mathematics, physics, trade economy, or technical trade-related subjects, in the secondary vocational schools.

Prospective vocational teachers must have a general intermediate or matriculation examination, have passed the engineering examination in a technical institution and have had two years' practice in

1. See Finland's reply to Unesco/ILO questionnaire; Aarno Niini, *Vocational Education for Industry, Handicrafts, Commerce and Navigation in Finland*, Helsinki, National Board of Education, 1968, 80 p.; René Nyberg (ed.), *Educational Reform in Finland in the 1970's*, Helsinki, Ministry of Education, 1970, 118 p.; Finland's reply to questionnaire draft.

industry before entrance into the Vocational Teacher Training Institute. As a result, although there is no minimum age set, in practice the minimum age is 24, and usually students enter between 28 and 30. The candidate must also pass an entrance examination before admission to the programme.

The course, which lasts one academic year, is divided into three periods:[1] five months' study in the institution, three months' teaching practice, and another period of two months in the institution. During the three-month period of practice teaching, the student must prepare a thesis on a pedagogical topic. A part of the curriculum is common to all students whatever their field, but the courses in vocational education and educational practice are given in one of the five possible fields of specialty: metalwork, machine repairs, electrical installation, the building and woodwork trades.

At the completion of this programme the student is recognized as having attained vocational teacher qualification. During the course, he takes examinations in all subjects and his specimen lessons and teaching performance are assessed.

VOCATIONAL TEACHER EDUCATION IN DEVELOPING COUNTRIES

One programme for the education of vocational teachers in developing areas has already been mentioned: the technical teachers college in Nigeria. The Technical Institute of Education in Chile, the Technical Department of the Teachers Training College in Singapore and the Men's Technical Teacher Training College in Turkey provide further examples of current developments in vocational teacher education.

Chile

The Technical Institute of Education in Chile is attached to the State Technical University and offers teacher preparation for both technical and vocational teachers in the general areas of commerce, industry and services and in specialized techniques.[2] The institute, in co-operation with the Ministry of Education, the university and the National Vocational Training Institute, also offers a special course to engineers, technicians and assistant technicians so that they may qualify as State teachers.

1. See Appendix III.1 for curriculum.
2. Chile, reply to Unesco/ILO questionnaire.

The institute offers a full-time programme for the education of vocational and technical teachers which lasts from four to five years. Candidates must have completed their secondary education and passed a university entrance examination before admission into the programme.

The curriculum is designed to give the student an integrated education comprising pedagogical subjects, general subjects and the theory and practice of the special technical subject. On the average, the student spends about thirty hours per week in his courses.

The rough percentages of time spent in each general field—general, pedagogical and technical—are respectively 15 per cent, 60 per cent and 25 per cent. Pedagogical studies then are far and away the most important element of the programme. The special industrial fields which future teachers may study are: machine tool engineering, electricity, motor engineering, interior construction, metal structures, sanitary installation and industrial tailoring. These special fields are studied making use of the facilities provided by the Technical University.

Once the prospective vocational teacher has completed his academic course work, he must fulfil the practical teaching requirement. He must also prepare a thesis in his field either individually or as a seminar project, and prepare for his degree examination. The examination consists of three parts—two written and one oral—in his special field. The prospective teacher receives a university degree in his field and teaching qualification awarded by the university council.

The vocational teacher in Chile, then, is trained in a university level institution. His training is primarily pedagogical and he has had little industrial experience. Since 1966, however, crash programmes have been instituted to train technicians from industry through in-service pedagogical courses.

Singapore

In the mid-sixties, Singapore undertook the development and expansion of all areas of vocational and technical education. From 1969, the country has continued this development with the aid of a five-year technical assistance programme funded and staffed by the UNDP (Special Fund) and executed by Unesco and ILO. One of the main areas of concentration has been technical and vocational teacher education.

The Technical Department of the Teachers Training College was established in 1963 and has continually expanded since that time. The Technical Department offers a variety of courses and programmes designed to train the whole range of technical and vocational teachers. There is one full-time integrated programme for technical teachers and several part-time ones which, among others, include in-service courses for upgrading technical and vocational teachers, in-service courses for those possessing a technician diploma, courses of technical studies and practical training for those who are already qualified teachers of general subjects, and a programme for vocational craft teachers. In 1969, the Singapore Technical Institute was created; it eventually will be located in the same complex as the Technical Department of the Teachers Training College so that more efficient use may be made of expensive machinery and equipment. The Technical Department, or the Technical Teachers College as it is now called, as a whole then provides a good example of a flexible institution conceived so that it may create programmes according to the needs and possibilities of the country at a given moment.

In Singapore, as in most developing countries, it has proved virtually impossible to recruit future vocational teachers from industry and the trades, and the situation has been aggravated by the rapid expansion of vocational education. Vocational teachers are responsible for the instruction of vocational subjects in the nine vocational institutes on the upper secondary level yet in 1968 only one such institute existed. In 1969 a crash programme was begun at the Technical Teachers College to train staff for this burgeoning area of education. The course is three years in length. The first year is one of full-time studies taken at the Technical Teachers Training College, in which practical training in the special craft or trade is emphasized. The second year is passed in in-plant training. During the third year, students are assigned to teaching posts in the vocational institutes, and follow a course of part-time pedagogical studies at the teachers' college. The level of this preparation is upper secondary and lower tertiary. The minimum qualification for entrance is the school-leaving certificate or its equivalent, obtained after the fourth year of secondary schooling or at age 16. The award at completion of the course is an 'In-service Certificate'. This is a temporary programme only, and it is envisaged that the programme will either be extended to a four-year one, or that the training of vocational teachers will be incorporated with that of technical teachers in the proposed three-year full-time programme to be discussed in Chapter VI.

Turkey

The Men's Technical Teacher Training College in Ankara, Turkey, is the only institution of its kind in that country. Established in 1961 with the help of the United States Agency for International Development, the college is designed to receive graduates of the vocational and technical secondary stream who are successful on the entrance examination and to prepare them for vocational and technical teaching. The college is one of the few post-secondary institutions in Turkey to which graduates of the vocational-technical streams may aspire—the others being four public academies of higher education awarding B.Sc. degrees in engineering and architecture. Higher education in the universities, even the technical universities, has in the past been reserved for graduates of the general secondary school system, although reform of this system is now underway.

The Men's Technical Teacher Training College offers a four-year programme of integrated general, pedagogical and technical studies. The course leads to a diploma in technical and vocational teaching. The curriculum includes five groups of subjects: general, science, pedagogic, technical laboratory and practical work. The percentages of time devoted to each group are respectively 11 per cent, 14 per cent, 6 per cent, 25 per cent and 44 per cent. Also, each student is required to work at least sixty days in industry. Students may specialize in one of the following subjects: machine tools, sheet metal, forging and welding, foundry, pattern making, automotive mechanics, electrical power, electronics, carpentry, building construction or the sanitary trades. The college also provides in-service courses and special vacation courses for employed teachers.

The programme, then, is heavily slanted towards the practical training of the student with almost 50 per cent of the curriculum devoted to laboratory and practical subjects. Certainly where there is little opportunity for industrial experience, this emphasis is a necessary substitute if not the ideal solution. It is all the more necessary where, as in Turkey, the thrust of secondary education, even in the vocational and technical streams, is academic.

At present, the quality of the courses at the college does not prepare the students to be teachers of technicians. Plans are underway, however, to upgrade the courses so that technical teachers will be trained in addition to vocational teachers.

The three programmes discussed above illustrate the trend in developing countries toward vocational teacher preparation in

courses of integrated study. The facilities in Chile differ from those in Turkey and Singapore in that they are attached to a university, therefore the level of academic training is higher. Rather than a four to five-year degree course as is the case in Chile, the Technical Department of the Teachers Training College in Singapore offers a three-year course leading to teacher certification, although the Singapore programme may well be advanced to the Bachelor of Education level. In Turkey and Singapore, more emphasis is placed upon practical training. The next step is to upgrade the academic qualifications of vocational teachers to the desired level of a university degree or a higher education diploma. Yet this should be done without detriment to the practical training requirements.

CONCLUSIONS

A comparison of the eight programmes discussed shows very little in common except that for all a solid secondary education is required for entrance, and that the programmes are designed either to give an integrated education or to train a teacher with the equivalent of an integrated education by emphasizing those areas in which the recruit is not yet competent. After this, a rigid comparison breaks down. The institutions range in level from post-secondary to post-university; the graduates of these institutions have a comparable range of education and competence. Once again the ambiguity of the position of the vocational teacher should be emphasized. In some cases, by the level of his training he is virtually indistinguishable from the technical teacher, in others he functions primarily as a workshop teacher. Certainly it will take more time, in industrialized as well as developing countries, to develop programmes which train vocational teachers on the desired level in institutions of higher education. This goal is complicated by the fact that experience in the occupational field is a necessity for the vocational teacher. It is desirable but less necessary for the technical teacher, and in the case of workshop teachers, recruitment is usually from employment. The ideal training for the vocational teacher then will take more time than that for a general secondary teacher. Until the vocational teacher is generally accepted as having at least comparable status, fewer qualified candidates than needed will enter vocational teacher preparation programmes.

PREPARATION OF WORKSHOP TEACHERS

The workshop teacher is at the very foundation of any form of vocational education. It is he who teaches practical skills to future

skilled and semi-skilled workers, and to technicians. He may, however, in some school systems be called upon to teach theory on the lower levels of secondary education, and in others 'workshop teacher' is synonymous with 'vocational teacher'.

In industrialized countries, workshop teachers are most often drawn from the ranks of skilled workers who have had considerable occupational experience. Indeed, experience in the subject he is to demonstrate and in which he is to transmit skills is the prime requisite for a competent teacher in this field. It is through him that the students will have their first real contact with the working world.

If the prime qualification for the workshop teacher is employment experience, nevertheless he must acquire further education if he is to be an effective teacher. Certain problems are involved in creating programmes to prepare these teachers. Often the prospective teacher has not completed secondary education, having gone to work at an early age, between 15 and 17. For him, then, the most important aspects of a teacher preparation programme are the extension of his general culture, the strengthening of his ability to communicate both in writing and orally, and pedagogical methodology to enable him to better explain and communicate his skills.

Because workshop teachers are at the base of vocational education and the consequent creation of a pool of skilled manpower, their training has had priority in many developing countries. In many cases, workshop teachers constitute the only group of vocational teachers who are trained at home rather than abroad. And programmes for workshop teachers have been conceived as jumping-off points for the eventual development of vocational teacher preparation programmes of longer duration.

Often in developing countries the programme for workshop teachers must include the development of craft or trade skills. Once again we come up against the problem of how to provide the requisite industrial experience for future teachers. Clearly at the present time it is not possible, and so programmes must be integrated.

Very often in developing countries the workshop teacher is not distinguished from the vocational teacher—for training programmes exist only for the former category. The graduates of these programmes must serve then as teacher-instructors, although in some cases their educational level is not as high as desirable for a vocational teacher.

Two examples of programmes designed specifically to prepare workshop teachers were mentioned in Chapter II: the industrio-pedagogical institutes in Poland, and the course leading to the qualifications of *professeur technique adjoint* or *professeur technique de*

l'enseignement professionnel at ENNA in France. Furthermore, we have seen the example of Finland where vocational teachers and workshop teachers are given the same pedagogical programme, the category of teacher into which they fall being defined by the technical qualification they possess prior to taking the course. In the following pages further examples from both industrialized and developing countries will be discussed. Again, as in the case of vocational teacher preparation programmes, the course may be either integrated or strictly pedagogical, and is usually given in a specialized institution.

It should also be pointed out that whereas virtually all vocational teacher preparation programmes are under the authority of ministries of education or educational institutions, sometimes in the case of workshop teachers, the programmes come under the authority of a ministry of industry and/or labour.

WORKSHOP TEACHER PREPARATION IN INDUSTRIALIZED COUNTRIES

Workshop teachers in industrialized countries are in almost all cases drawn from the ranks of skilled workers. Very often the pedagogical training received by this category of teacher is rather minimal, most often taking the form of brief part-time pedagogical courses. Several countries, however, have special programmes designed to train a rather high calibre workshop teacher. The industrial instructor training technicums in the U.S.S.R. provide an example of a highly developed integrated programme under the aegis of the education authorities. The Vocational Training Institute recently instituted in Japan provides another example of an integrated programme, in this case under the authority of a corporation governed by the Ministry of Labour in conjunction with industry. The strictly pedagogical courses for the training of workshop teachers in Sweden and Austria will also be considered.

Union of Soviet Socialist Republics

The Soviet system of workshop teacher preparation is very highly developed. The reason for this development is that the Soviets consider the workshop teacher to be the keystone of the vocational education system. He is responsible for a small group of students throughout their school career and is concerned not only with their education in industrial skills, but with their moral education as well. Since the workshop teacher plays a special role in the Soviet system,

wide provision is made for his education and training in the fifty-five industrial instructor training technicums.[1]

The industrial instructor training technicums may be characterized as specialized advanced secondary institutions. Because of the higher entrance qualifications required, the students are usually older than those in ordinary technicums, which correspond to technical *lycée* or upper secondary technical schools. The course varies from three to four years in length, depending on the level of general education achieved by the future teacher before entrance. The technicums are staffed by university graduates as teachers of theory and by masters with a specialized secondary education and high professional qualifications for practical training.

In order to qualify for entrance to a technicum, a candidate must have had eight to ten years of general education, with vocational education as a part of or in addition to the general education. He must also have achieved highly skilled worker qualification in industry. A student may enter a technicum directly from a vocational-technical or technical school if he has graduated with distinction. It has been found, however, that the most successful students are those who have had several years' industrial experience. The candidate is required to pass an entrance examination proving proficiency in his special field. The examination consists of a test assignment which the candidate takes a day to prepare, e.g. a turner might have to fabricate a bolt and special nut in steel according to certain specifications. The following day the candidate must take an oral examination on the technological aspects of the test assignment. He then must take a written examination in Russian language and an oral examination in mathematics. Recruitment is encouraged by vocational and technical teachers who guide students who seem to have the aptitude towards the instructor training technicums.

The curriculum is designed to give the student a balanced programme of general studies, technical studies (general, theoretical, special theoretical and practical), and theoretical and practical pedagogical training. Because of the emphasis on general studies (33 per cent of the syllabus) which brings the level of general education up to the secondary leaving level, graduates of the technicums have the possibility of going on to university studies. The curriculum for students preparing to be instructors in the special field of metal cutting machine tool operation may be found in Appendix III.2.

1. The information on the technicums in the U.S.S.R. was taken from an unpublished paper written under contract to Unesco: V. A. Elizarov, 'The Preservice and In-service Training of Technical and Vocational Teachers', 1969, 67 p.

Throughout the four years in the industrial instructor training technicums, great emphasis is placed upon the quality of the practical work of the student whether in his teaching practice or in workshop practice. In the year following completion of each of the three sections of the pedagogical curriculum, the student has a period of teaching practice directly related to what he has learned. For example, in the first year, students are required to take educational psychology and in the second year, to observe for a brief period a real classroom situation in the light of its psychological implications. In the last year, the student teaches for nine weeks, usually in the school where he will be placed after graduation. During this period, he is expected to gather material and begin his diploma project. The future instructors spend more time in workshop practice than in any other section of the curriculum. Students are expected to attain the level of master craftsman by the time of graduation. Each technicum has a workshop attached which is a producing factory but which is geared to the educational requirements of the future instructors. The products of these workshops must meet national standards before they are put on the market. In the last year students must also spend six weeks in a factory under supervision. During this period, students spend time in each of the departments of the factory, e.g. orientation, work in main shops, repair service, design office, labour organization and wages department.

The diploma project is the culmination of the four-year course. In it the student must show both technological proficiency and pedagogical aptitude. The project consists of seventy to eighty pages of written explanatory material, as well as drawings, diagrams and plans. Often a teaching model is included as well. For example, a project for students in mechanical engineering might be: 'Design a shop to produce 5,000 aprons for engine lathes annually. Draw up a teaching schedule and a plan for a lesson on the subject of the boring of through holes. Prepare a teaching model of a jig for drilling holes in the apron under the flange.' The diploma projects are presented to a State examination committee which judges on the acceptability of the diploma project and awards qualifications.

Japan

Japan, with its tradition of leaving the responsibility for vocational training and teacher preparation to industry, does not as yet have highly developed vocational and technical education in schools.[1]

1. Japan, reply to Unesco/ILO questionnaire; Employment Projects Corporation, *The Institute of Vocational Training.*

Though such courses do exist in schools, both public and private, the bulk of the responsibility for training skilled workers lies either with industry or with the vocational training centres under the authority of the Ministry of Labour. Therefore no special institutions under the Education Ministry exist for training vocational teachers and workshop instructors. However, there is one institution, the Vocational Training Institute, under the authority of the Employment Promotion Projects Corporation, a semi-governmental body, and the Ministry of Labour, which trains teaching personnel for industry and for the public vocational training centres.

The Vocational Training Institute performs a number of functions. In addition to training instructors, it is a research centre, a centre for training instructors from overseas (Colombo Plan) and a centre for retraining or upgrading workers in special skills. With regard to instructor training, it may be considered a tertiary institution.

The full instructor training programme at the institute lasts four years. This programme is designed for future instructors recruited from the ranks of high school graduates and who pass a general examination on intellectual ability and aptitude for the course. No prior industrial experience is required for entrance. There is in addition another programme of six months' duration for candidates who are either high school graduates with five years' experience in industry, or are highly skilled workers who have been recommended by industry for the course.

The four-year course is an integrated one, comprising general, technical and pedagogical subjects, with arrangements for practical work for the latter two. All students take the same general courses and the same courses in pedagogy. General subjects include: ethics, social and political sciences, economics, labour problems, mathematics, physics, chemistry, foreign languages and an introduction to industrial management. Included in the pedagogical subjects are: educational psychology, principles of vocational training, livelihood guidance, study of teaching materials, methods of classroom teaching, methods of job instruction and instructional experience. As his special subject, the student may choose from among: casting and forging, mechanics, woodworking and painting. In the third year of the programme, students acquire mastery of their field through experience in production plants. In the fourth year, students are assigned to various training centres for a period of practice teaching. After graduation from the course the instructor is qualified to teach both the theory and the practice of his field and thus functions as both a vocational and a workshop teacher.

Two examples of rather different integrated programmes for workshop teachers have been given: the Soviet programme responsible to the education authorities; the Japanese, to labour and industrial authorities. Strictly pedagogical programmes for the training of instructors exist as well. We will look first at the Swedish experience and then at a programme in Austria, both directed by education authorities, for examples of exclusively pedagogical training.

Sweden

The Swedish system of workshop teacher training is, then, in contrast to the Soviet and Japanese programmes, purely pedagogical.[1] Instructors are trained in courses lasting one academic year (thirty-three weeks), given in five institutes of vocational pedagogics.

In order to enter an institute of vocational pedagogics, a candidate must have a leaving certificate from one of the old primary schools or one from the present-day comprehensive schools. In addition, the candidate must have had seven years' experience in his field. He must possess a theoretical knowledge on the foreman level, or a technical certificate with good marks. There are no maximum and minimum ages for entrance but in practice the minimum age is 22, and the average candidate is older.

The course is broken down into two terms of fifteen weeks each plus a period of three weeks at the end of the year for review of the first term's work. In the first term the students take general and specific pedagogical courses, a list of which, together with the relevant number of hours (in parentheses), is as follows:

1. Pedagogics (215), methods (75).
2. School hygiene (6), library knowledge (6), labour-market questions (10), craftsmanship (10), industrial physiology (6), industrial welfare (8), speech training (10).

Included in his pedagogical training in the first term are seventy training lessons which the student must prepare. In the second term, he works as an assistant teacher in a vocational school. He is visited by his supervisor and by the headmaster of the school who evaluate his progress. In the last three-week period of revision, he must present sample lessons to be judged by all the supervisors. Also during the second term each student must prepare an individual project.

1. See: Sweden, reply to Unesco/ILO questionnaire, reply to questionnaire on draft.

Efforts are now being made in Sweden to co-ordinate all teacher training within the framework of a single school of education organization. The vocational pedagogical institutes are to merge with this organization as from 1 July 1972. The training of teachers of non-theoretical subjects is at present under investigation. This investigation is expected to lead to proposals for the completion of virtually all subject studies prior to the commencement of practical and pedagogical training.

Proposals already put forward concerning teachers of vocational subjects are at present undergoing review by the National Board of Education.

In the new curricula for the upper stage of secondary schools, put in action in 1971, theory and practice in the vocational area will be integrated. In consequence the National Board of Education has made a proposal to the government to change the entrance requirements to the teacher training colleges.

The new system of the educational programme for a future teacher in a vocational field may be divided into four steps:

1. Secondary school education up to 18 consisting of general education and practical training in the future teacher's special field.
2. Practical experience obtained from regular employment during at least five years.
3. Theoretical studies at post-secondary level on a regular basis for one year. The aim of this course is to make the future teacher technically more qualified and enable him, on the basis of his employment experience, to see his special field in a broader context. After this course, there will possibly be a period of further employment experience required.
4. One-year pedagogic-educational studies and instruction at a teacher training college.

In the system for the time being the minimum length of the practical experience is seven years. On the other hand, theoretical studies on the post-secondary level are not formally required at present. Thus the current trend in Sweden is to dispense with the distinction between the vocational and the workshop teacher.

Austria

Austria's system of vocational education is similar to that of the Federal Republic of Germany and Switzerland. Vocational education in institutions under the education authorities is compulsory

for apprentices from the age of 15 to 19 who constitute the majority of this age group. According to the dual system, as it is called, apprentices are trained by their employer and also attend vocational schools (*Berufsschulen*) which provide complementary vocational education which includes general studies as well as related vocational theory and workshop practice. During the last ten years, instead of day-release courses, block release courses of eight weeks' duration per year have been introduced to provide a more specialized vocational education (*Landesberufsschulen*). Further, an increasing number of full-time vocational and technical schools are organized under the education authorities with programmes of two to four years' duration, depending on the specialty (*Fachschulen*). Five-year technical secondary schools which, in our terminology, belong more to technical education, exist to prepare technicians. Vocational and workshop teachers are prepared in three federal institutes of vocational education (*Berufspädagogische Institute*), which play an important general role in vocational education in Austria.[1] These institutes are also responsible for the further education of vocational and workshop teachers by offering in-service courses, seminars and facilities for teachers' meetings. Furthermore, they serve as research centres for dealing with special problems in vocational education. A full-time course is offered as preparation for taking the Teacher Certification Examination.

There are three categories of vocational teachers for vocational schools: the teacher of civics and management theory, the teacher of theoretical vocational subjects, and the teacher of workshop practice. The pedagogical course is virtually the same for all three categories; the entrance qualifications, however, are different. It should be further mentioned that all three categories have the same salary and working conditions in employment.

In the full-time one-year course, the major emphasis is given to pedagogical studies; a considerable number of general subjects are included, however, in order to expand the general education and culture of vocational and workshop teachers as may be seen from the curriculum in Appendix III.3.

Admission to the programme entails several requirements. Only those candidates are admitted who have already proved their aptitude for and interest in teaching by having taught their specialty at least one year in the schools. Furthermore, candidates wishing

1. See: K. Koweindl, (comp.), *The Federal Institutes of Vocational Education in Austria*, working paper for the Council of Europe course on 'Training and Further Training of Teachers at Technical Schools', Bad Hofgastein, 5–10 October 1970.

to qualify as workshop teachers must have proof, according to trade legislation, of their competence in the special trade or craft (e.g. have achieved the rank of master-craftsman (*Meisterpruefung*) or its equivalent. They must have at least six years' employment experience acquired from age 18 or after, and after completion of a skilled workers examination.

After completion of the course, student teachers take the Teacher Certification Examination, which is a State examination and includes preliminary examinations, an oral and written final examination and a trial lesson. If successful on this examination, they become certified teachers of practical subjects in the part-time or full-time vocational schools, or secondary technical schools. They are entitled to apply for a permanent post.

In Austria, then, workshop teachers or teachers of practical subjects possess considerable experience in their field, and must have had some teaching experience before they may study to become full-fledged members of the teaching profession. The programme in the institutes of vocational education which emphasizes the principles and practice of pedagogy as they particularly relate to workshop teaching also furthers the general education of students to the advanced secondary or immediate post-secondary level. This general education is a particularly important element in any programme for preparing workshop teachers. For, if they must have a complete mastery of their skills, they must also have the ability to communicate these skills and to view their subject in a larger social context.

WORKSHOP TEACHER PREPARATION IN DEVELOPING COUNTRIES

Workshop teacher preparation in developing countries is frequently under an authority other than that for education, e.g. a ministry of industry, labour or social affairs. This is often the case where practical vocational education is not highly developed in the schools and so occupational training has developed upon industry. The fact that often industry and the trades are responsible for practical training tends to create the problem of too radical a separation between education and employment by giving both workers and their teachers a too-specialized training. As a result, programmes for the preparation of workshop teachers have, for the most part, been more intensive and been in operation longer than those for vocational teachers. Among the reasons for this is that workshop teachers may be trained relatively rapidly, and may be recruited in greater numbers as the level of formal education required is lower than for

the vocational teacher, although this is a situation which must be improved as more practical subjects are made a part of the school curricula. The programmes in India, in the Arab Republic of Egypt and in Tunisia serve to demonstrate what is currently being done in the area of workshop teacher education.

India

In India, workshop teachers for industrial institutes are trained in seven central training institutes for instructors.[1] The institutes are run under the aegis of the Directorate-General of Employment and Training and the Ministry of Labour, Employment and Rehabilitation. India might serve as an example for countries where there is a federal form of government.[2] The institutes are controlled by State authorities; the central government, however, sets the standards and policy by which the institutes must be run, as well as the curriculum.

The course in the institutes lasts one year. Candidates for entrance must have completed their general secondary education with mathematics and science as their main subject. They must also have a national trade certificate in their field and two years of experience in industry. Candidates are usually between 20 and 30 years of age when they enter into the programme. The entrance qualifications may be relaxed in favour of candidates nominated by either central or state government institutions or by private industry. The level of the institutes may then be characterized as post-secondary. Graduates of the institutes teach either in the industrial training institutes or in industry.

The training in the institutes is primarily technical and pedagogical with greatest emphasis on practical achievement in each field. Workshop teacher preparation may be in the following fields: carpentry, draughtsman (civil and mechanical), electrician, grinder, fitter, mechanical instruments, machinist, motor mechanics, moulder, sheet metal, pattern maker, turner, welder, wireman, cutting and tailoring, embroidery and needlework, electronics, tool and die-making and training to be a blacksmith. Students

1. India, reply to Unesco/ILO questionnaire and a brochure *Central Training Institutes for Craftsmen Instructors*, New Delhi, Ministry of Labour, Employment and Rehabilitation, n.d.
2. It should be noted that several types of programmes exist in India for training vocational or crafts teachers for the schools. These may be given in regional colleges of Education or in one of four technical teachers' training institutes, which institutions are under the authority of the Ministry of Education and Social Welfare.

pursue studies not only in their special field, but are given the opportunity to learn an allied trade as well. Students take courses in general pedagogics and teaching methods as well as social studies and workers' education. Technical theory is taught only in relation to the specific trade. Practical experience in the trade is obtained in workshops attached to the institutes. The period of practical teaching (six months), is carried out in vocational centres attached to the institute.

Examinations are given in each subject, and a final examination usually lasting five days serves as the basis for qualification. In the course of his studies, the student is also required to prepare projects of two types. The first type is the preparation of teaching materials, including audio-visual aids in relation to the special trade. Also, students must do project work relating to trades and skills other than their specialty. The subjects covered in the final examination are: trade theory, trade practice, engineering drawing, workshop calculations and science where applicable, and methods of instruction (theory and practice). The National Council for Training in Vocational Trades conducts the examination and awards the Craft Instructors Certificate on the basis of the student's performance in the final examination as well as his performance throughout the course. Experts from industry participate in the final trade test.

In India, in the vocational instructor training centres as in the institutions which train teachers for the schools, no distinction is made between the vocational theory teacher and the teacher of practice. The instructor trained at a central institute is responsible for teaching both trade theory and trade practice.

Arab Republic of Egypt

In the early 1950s the Government of the then United Arab Republic in co-operation with ILO began a programme of developing vocational training in the country.[1] In 1961 an agreement between the government and the United Nations Special Fund was signed for the establishment of a Vocational Instructor Training Institute in Cairo, a project to be executed by ILO. The institute, created for the purpose of giving theoretical and practical instruction to workshop teachers, either new recruits or employed instructors, as well as refresher courses for instructors and courses for training-officers and their assistants, was opened in 1964.

The one-year course offered at the Vocational Instructor Training

1. ILO/UNDP, *Vocational Instructor Training Institute, United Arab Republic*, Geneva, ILO, 1967.

Institute is on the advanced secondary level. Candidates for the programme must have either completed a secondary industrial school or have served a three-year apprenticeship. In all cases, candidates must have had at least five years' experience in industry. Furthermore, all candidates must pass an entrance examination before acceptance into the course.

The programme emphasizes practical trade studies and industrial pedagogy. The three major trade areas offered at the institute are the metal, the electrical and the automotive. Students specializing in the textile, printing, building, glass and leather industries take their theoretical instruction at the institute and do their practical work in appropriate training centres.

The programme is divided into three phases. The first phase, lasting eight weeks, serves as an introductory and orientation period. At this time, students practise skills basic to a number of trades, and have classroom instruction to refresh and extend their knowledge of general technology, mathematics and drawing. The students view a number of films and attend general lectures designed to stimulate their interest in the course. At the end of the period, an examination is given in order to test the knowledge acquired by the candidate and to acquaint him with the institute's examination procedures. Students must pass this examination before continuing with the course.

The second, and longest, phase lasts thirty-three weeks. In this time the student takes courses in the technology of his field—two hours for every day he spends on the shop floor. In addition, he takes courses in general and special trade instructing techniques four hours per week. In the special trade instructing techniques course the students are divided into groups of three or four, each taking turns at preparing a lesson to be given before the others for suggestion and criticism. Students also receive instruction in industrial psychology, shop safety and first aid in this phase, as well as engaging in a number of extra-curricular activities. The second phase ends with two intermediate examinations to test the progress of the future instructor.

The third and last phase is of five weeks' duration. The first three weeks are spent teaching in a vocational training centre, under the supervision of institute staff. The last two weeks are devoted to review of the course and final examinations, which include both theoretical subjects and shop tests. The final evaluation of the student is based upon his performance not only on the final, but on all his examinations, and the quality of his practical work both in the shop and during the period of practice teaching.

Tunisia

The thrust of the programme at the Vocational Instructor Training Institute in Cairo is practical, designed to give the student a thorough grounding in the practice of his trade. The programme in Tunisia, also set up under the auspices of the United Nations Special Fund, with ILO as executing agency, differs in several ways, the primary being that it is a semi-integrated programme offering, along with pedagogical and technical instruction, general courses as well.[1]

The Institut National de Formation et de Perfection Professionnels (national institute for vocational training and upgrading) at Rades, Tunisia, is under the direction of the Secretary for Youth, Sports and Social Affairs. Created in 1963 for the training of workshop teachers, foremen, directors of vocational schools, and general education teachers in the vocational schools, the institute also serves as a research centre whose functions include the establishment of programmes for the vocational training centres and the pre-apprentice centres or vocational schools. The workshop teachers trained by the institute are prepared to teach practical skills to adolescents from 14 to 17 years of age in the various centres where vocational training is given.

The institute is an advanced secondary institution offering a one-year course for instructor preparation. Candidates enter the programme between 20 and 35 years of age. They are required to have one of two sets of qualifications. The candidate may hold a certificate from an intermediate secondary industrial school (*brevet d'enseignement moyen (industriel)*) or a certificate of aptitude in his trade (*certificat d'aptitude professionnelle*). In either case he must have had two years' industrial experience. Alternately, the candidate may have no certificate or diploma but have five years' employment experience. In all cases, prospective students must be successful on the entrance examination. The examination includes tests of the candidates' knowledge in trade practice, technology, arithmetic, drawing, and of his ability to write, as well as tests of psychological technical aptitude, a medical examination and an interview.

The curriculum is a semi-integrated one. Although 60 per cent of the course is devoted to trade practice and technical theory and 21 per cent to pedagogical methods, 19 per cent is devoted to general

1. Secretariat d'État à la Jeunesse, aux Sports et aux Affaires Sociales, Office de la Formation Professionnelle et de l'Emploi, *La Formation des Centres Masculins et Feminins de Préapprentissage (au Centre de Préparation Préprofessionnelle)*, 1968.

studies which include French, Arabic, civics and industrial legislation. The curriculum may be found in Appendix III.4.

It is worthwhile noting that when the programme originally began in 1963, no provision was made for general studies. From 1967, however, courses in French, Arabic and civics were included, with a view of raising the general educational level of the workshop teacher and hence his ability to communicate more effectively.

As can be seen from the following curriculum, the programme is divided into two phases, the first lasting eight months and the second lasting two months. In the first phase students take the general courses as well as general technology and drawing. The instruction, however, emphasizes the development of trade skills in the workshops. In the last and shorter phase (two months), students pursue their pedagogical studies and spend two weeks' practice teaching in a vocational training centre. Another element to be remarked upon is the attention given to training in the use of audio-visual aids, particularly important for teachers in areas where the level of general education, hence the ability to read, write and understand through the written word, is limited. (The syllabus for the course in audio-visual techniques which, though very basic, may nevertheless serve as a model for a starting point in the institution of such courses, may be found in Appendix V.6.)

After completing the course, students take final examinations in all subjects, both theoretical and practical. Throughout the programme, students receive marks in their courses and take general examinations as well. Their over-all performance is judged by a jury. If positively evaluated, the student becomes an instructor in one of the pre-apprentice centres or vocational training centres.

CONCLUSIONS

From the above discussion, it is clear that the general educational level of programmes of workshop teacher preparation is on the advanced secondary or post-secondary level and although the length of time varies, employment experience at skilled worker level is the prime requisite for entry. The programmes vary in length depending on the entrance qualifications and whether the studies are integrated or are primarily pedagogical.

Whereas industrial experience may be the prime prerequisite, the general education of the workshop teacher is of utmost importance. For unless he has mastered communication skills and unless his level of general education is superior to that of his pupils, he will not be an effective teacher, despite his exposure to pedagogical

theory and methods. The programme of the federal institutes of vocational education in Austria and the experience of Tunisia which found it necessary to change the curriculum of the institute at Rades, provide an example of the recognition of this basic problem as well as methods of solving it. Therefore, it is to be highly recommended that programmes of workshop teacher preparation be conceived of not only as training programmes but as educational programmes as well. For to repeat a point made several times, the workshop teacher is at the very foundation of vocational and technical education, and the quality of that education depends greatly upon his ability to communicate his specific knowledge and skills to his pupils in a more general context. With this broader background, the workshop teacher will be better prepared to help his pupils associate their practical education with their roles as individuals and as members of a society. Preparation of this type of teacher is particularly important for developing countries who must extend vocational education—both theoretical and practical—in the schools, if the prerequisites for long-range economic and social development are to be met.

SUMMARY AND CONCLUSIONS

A wide variety of programmes, therefore, exists for the preparation of vocational teachers and workshop teachers responsible for the theoretical and practical education of skilled workers and ordinary technicians. The diversity of the programmes clearly emerges. For both categories of teachers, integrated and strictly pedagogical programmes exist. These programmes may be offered in all institutional patterns distinguished in this study, i.e. specialized institutions, technical institutions, or departments attached to general education institutions. They also vary in length and in the percentage of the curriculum devoted to each general area of study—technical, pedagogical and general. Entrance requirements vary widely as well, depending on the type and level of programme. Several general characteristics or trends may, however, be distinguished for each of the two categories of teacher.

In the first place, in many cases, programmes for the preparation of vocational teachers are either at present, or are tending toward, a university level, that is toward the first university level degree offered in a given country, e.g. bachelor's, *licence*. It is generally agreed that vocational teachers should obtain a relatively high level of general education, technical qualification, and fairly extensive

pedagogical training. The trends toward the upgrading of vocational teacher education are certainly highly desirable ones. With this upgrading, perhaps the ambivalent position of the vocational teacher in most educational systems will be changed to one of recognized status.

One major problem exists in vocational teacher education: how to make provision for the industrial experience so necessary to the effectiveness of technical and vocational teaching on the secondary and post-secondary level. Although the vocational teacher may be teaching theory primarily, he must be able to relate this theory to the practical studies of his students as well as understand their future work environment so as to aid them in achieving a more meaningful education. And certainly industrial experience is even more important for the vocational teacher who is responsible for both the theoretical and practical experience of his pupils, or the vocational teacher of young workers already employed but continuing their schooling part-time. Where vocational teachers are recruited from industry, or where industrial experience may reasonably be required before entrance into a teacher preparation programme, the problem is not so grave. Where, however, few recruits can be attracted from industry, or where there is little opportunity for industrial experience, another tack must be taken, and provision for industrial experience made in the course of the programme. This may be done in two ways. Either agreements can be made with various enterprises to allow student teachers to work for a brief period, or factory conditions may be simulated in school workshops. Each has its advantages and disadvantages. The experience in an enterprise may be more 'real', but on the other hand, industry is often reluctant to take on novices for short periods of time and conditions are obviously geared toward production rather than education. On the other hand, simulated factories in the schools are geared towards education, and production may be subordinated to educational needs. Yet this solution is expensive in terms of space and equipment, and it may not be a 'real' experience.

Programmes designed especially for workshop teachers may be said to be generally on the advanced secondary or post-secondary level. The level, of course, depends upon how secondary education is defined in a given system. For example, the technicums in the U.S.S.R. are classified as advanced secondary specialized institutions, but the quality of education is superior to that of some institutions in other countries classified as post-secondary. In virtually all cases, a considerable amount of experience in employment is required before entrance. The thrust of most programmes for

workshop teachers is therefore pedagogical, the U.S.S.R. being a major exception as the level of general education in the technicums prepares the student for university entrance if he so chooses.

The future workshop teacher, then, in most cases has developed his technical skills to a relatively high level through training and experience. The major problem facing the educators responsible for the preparation of this category of teacher is how to upgrade the general level of education. Where workshop teacher training programmes are under the authority of ministries of labour or industry, the problem may not be immediately recognized. It is desirable that educators be associated in the planning of such programmes, just as representatives from government agencies responsible for industry should be associated with programmes under the aegis of educational authorities.

Pedagogical studies, both theoretical and practical, are a vital element in the preparation of competent vocational workshop teachers. Any thorough programme of teacher preparation includes four elements. The whole programme should be based upon a philosophy of education, and the student should be encouraged to develop his own philosophy. In doing this, the future teacher will be better able to relate his particular job to a larger context of the goals and objectives of technical and vocational education. Teachers on the secondary level should also be aware of the psychology of adolescents—their problems, how they learn, etc.—with particular reference to adolescents with technically oriented aptitudes. The third necessary element in a pedagogical programme is teaching methods: how may technical material, both theoretical and practical, be designed and presented in the most effective and comprehensible fashion. The fourth element is practice teaching under the guidance of an experienced teacher or supervisor. Through his practice teaching the student may correct errors early and may establish a modicum of self-confidence before being totally responsible for a class.

A clear distinction has been made in these pages between the vocational teacher and the workshop teacher on the basis that the former tends to be responsible for theory and the latter for practice. In countries where this distinction obtains, there is a tendency to upgrade the vocational teacher to the position of a technical teacher in terms of status and the academic level of studies.[1] A strong argument may, however, be made for a contrary trend—to merge the

1. Refer, for example, to the projected reforms in France concerning the teacher of theory in the *collèges d'enseignement technique* and to the highly academic programme in the Federal Republic of Germany.

vocational and the workshop teacher, hence more closely relating theory and practice in the vocational curriculum. This is, for example, the current trend in Sweden, is also often the case in the United States and tends to be the case in the United Kingdom. The close relation between theory and practice is desirable from an educational point of view. Furthermore if different teachers are responsible for theory and practice, the workshop teacher usually has a lower status, and therefore students tend to associate practical work with an inferior status. For these reasons, some developing countries might find it beneficial to train vocational teachers capable of teaching both theory and practice rather than preparing two separate categories of teacher for vocational education.

There is obviously no ideal system for either vocational teacher or workshop teacher preparation. Too many variables are involved. The type of teacher preparation, will, among other things, depend upon prevailing educational philosophies, systems of education, as well as stages of economic development which determine necessary priorities. What can, however, be most highly recommended in developing regions is flexibility in the planning and initiation of programmes for vocational and workshop teacher preparation. Programmes should be so conceived that immediate needs may be filled, and what is constructed for a short-term purpose may be used as a jumping-off point for expansion.

It has been contended in this chapter that vocational and workshop teachers are at the heart of any system of vocational and technical education. It is they who educate and train skilled workers and ordinary technicians at the base of the economic development of a country. The most serious consideration should then be given to the development of programmes designed to prepare them for their tasks.

CHAPTER V

TRAINING OF TRAINING STAFF FOR UNDERTAKINGS

The need for qualified training staff in undertakings is due to the growing necessity for undertakings to operate their own training programmes which both complement and supplement the training given by establishments within the educational system of the country concerned. The extent to which undertakings participate in the initial training of the work-force varies according to the traditions in the different countries. Two contrasting forms of vocational training may be distinguished: a form in which full training, practical as well as theoretical, is given in schools; and a form in which primary responsibility for training is held by undertakings, although the training they provide is often supplemented by at least some related theoretical instruction in schools. Between these two extremes, there are a large number of intermediate forms of training in which school and in-plant training are combined in different proportions.

Even when school training is the rule, there is still a large training task for the undertakings to do: they must initiate vocational school-leavers into real industrial work; instruct them in specialized operations in the undertakings; update, upgrade and retrain workers already employed; provide training for promotion; etc.

While the training function of undertakings is usually a fully accepted fact in industrialized countries, this is often not the case in industrializing countries, particularly in those which are still in the early stages of development. Industry in such countries is often not yet in a position to provide adequate training and the main burden of vocational training therefore has to be borne by the public authorities. There are, however, strong technical and economic reasons why, as soon as feasible, undertakings should be led to play a greater part in the training of their work-force.

Technical reasons for undertakings doing so include their obviously greater ability to determine the kinds of knowledge and skill in which their staff need to be trained; their ability to train for

the particular type of technology used in their work; to give updating training as and where the need for it arises; by means of continuous observation at the various work-places, to ascertain the need for upgrading and skill improvement.

Major economic justifications for giving a substantial proportion of vocational training in undertakings include: the legitimate preoccupation of governments to aim at a more equitable distribution of the financial burden of vocational training by placing part of the burden on undertakings as users of the output of training; the generally lower cost of training in undertakings by comparison with training schools—the undertakings possess the necessary, often very expensive, equipment which schools usually have to buy specially and this equipment can be used more rationally in undertakings than in schools where machines and tools are frequently idle for relatively long periods; the possibility, in some cases, of using training-staff in undertakings more fully, particularly in the case of staff engaged part-time on instructional work.

It is clear, from this brief outline of undertakings' training functions, that undertakings cannot discharge this training responsibility without having trained staff who are technically and pedagogically qualified at their disposal. The recruitment and training of the two main categories of such staff—instructors and training-officers—in both industrialized and developing countries are discussed in the paragraphs which follow.

INSTRUCTORS

QUALIFICATIONS AND RECRUITMENT

The statements made in Chapter IV concerning the qualifications of workshop teachers are valid also for instructors working in undertakings. An expert group convened by ILO in 1969 stated that teachers of practical subjects (regardless of whether they work in schools, training centres or in undertakings) should have: (a) full technical or trade training for the occupation in which they give instruction; (b) several years' experience of work in the occupation; (c) to the extent possible, a level of general education higher than that of the persons to whom they will be giving instruction; and (d) special preparation for teaching.[1]

1. ILO, 'Report of the Technical Meeting on Training of Teaching Staff for Industrial Training Schemes', p. 30 (Doc. TMTS/1969/D.V.).

In addition to these technical qualifications, an instructor—as indeed all teaching personnel—must have certain personal qualities, such as moral integrity, an understanding of and liking for people, impartiality, a liking for teaching and an aptitude for it which can be developed through appropriate teacher training.

Instructors for in-plant training are usually selected from among skilled and experienced workers or, in industrialized countries, from among chargehands or foremen. In developing countries, it is often easier to obtain staff to teach theory than instructors of practical work. The difficulty of obtaining suitable candidates for practical training is due partly to the general shortage of skilled workers which makes employers reluctant to release them from production into training jobs.

A large number of developing countries have introduced legislation in recent years for the purpose of instituting or improving apprenticeship schemes in industry. The introduction or development of these schemes has led to a steady increase in the need for trained instructors, particularly when the legislation (in India, for instance, with the Apprentices Act of 1961) makes it compulsory for certain categories of undertakings to engage apprentices and to train them on their premises. However, apart from such elements of compulsion, there is evidence of growing awareness of the value of training among employers in developing countries. This awareness is often the result of long and persistent efforts in the fields of management development, productivity, supervisor training and in-plant training in general.

TRAINING

Like his colleague in vocational schools, the instructor in undertakings teaches practical skills to young people wishing mainly to become skilled or specialized workers. In addition he will be required to give updating and upgrading training and, possibly, retraining for new jobs, to adult workers. He may also be called upon to give initial training to adult workers without prior work experience. It is much less common for an instructor in industry to give theory lessons as well as teach practical work than for his equivalent in vocational schools or other training establishments to do so.

It is essential for training programmes for instructors, in industrialized and developing countries alike, to include: orientation on the psychology of young people and of adults and on the general principles of pedagogy applied to the categories of trainee and types

of training concerned; training in didactic methods and techniques and in the use of the different kinds of teaching aids such as models, films, slides and tape recorders; basic instruction in job analysis, instruction and experience in drawing up a lesson plan, instruction in how to evaluate trainee progress and performance; and instruction in the principles and practices of occupational safety and hygiene.

It is equally important for both industrialized and developing countries to provide for the periodical technical and pedagogical updating of all instructors in order that their instruction may keep abreast of developments in technology and pedagogy. In industrialized countries, technical updating for instructors is likely to be less of a problem than in developing countries. This is because undertakings in industrialized countries are more likely to be advanced technically and to be in a position either to provide the updating themselves or to arrange for it to be given elsewhere. In developing countries, however, many undertakings are likely to be operating at a less advanced technological level and with workers whose level of skill, technical knowledge and general education is below that of their counterparts in industrialized countries. In such a case, special arrangements will need to be made for the updating, which may well need to be supplemented by skill upgrading as well. The position is likely to be more satisfactory in both industrialized and developing countries in the case of part-time instructors who spend most of their time on production work. There is, however, often a tendency for full-time instructors to be rather cut off from day-to-day production operations in the undertakings. This tendency will of course need to be discouraged, but may have to be taken into account in considering what training for them should include.

Pedagogical updating, i.e. familiarization with new teaching methods, techniques and aids, is not in any circumstances an automatic process. Special organizational arrangements have to be made for providing this updating in some form. The main forms of pedagogical updating include: special updating and refresher courses organized at regular intervals or on an *ad hoc* basis, private study of relevant publications, correspondence courses, conferences and meetings, and voluntary study groups formed by instructors and other training-staff.

Position in industrialized countries

In industrialized countries, there is usually a wide range of facilities for the training of instructors for undertakings. In the first place,

there are the undertakings themselves: large undertakings have training departments which are capable of coping with all the training tasks which may arise; it would be uneconomic for all small undertakings to set up their own training schemes for their several needs, including those for instructor training.

The resources of the undertakings themselves are supplemented by those of other bodies. Many instructor training institutes are set up by federations of industry, chambers of industry, employers' federations, trade unions; facilities for training instructors for undertakings are also provided by educational establishments such as technical colleges or technical universities; private associations of various kinds also offer facilities for instructor training.

Arrangements made in the U.S.S.R. for the training of in-plant instructors responsible for training newly engaged workers illustrate the type of scheme which may be provided. The training was organized by the undertakings themselves and described in an article published in May 1965.[1] The scheme provided for foremen, chargehands and workers with at least the fifth level of qualification (skill levels of qualification usually run from one to six or eight) to become instructors by taking courses organized by their firms' training departments. Candidates for admission to these courses had to meet the following conditions: be generally competent in all types of work performed at the work-place and in operating the equipment used in the trade concerned; be familiar with modern techniques; show a general desire to pass on their skill, knowledge and experience to others; and possess the necessary aptitude for doing so.

The instruction was given in the form of seminars. The programme covered: principles to be applied in production training; rights and duties of the instructor, training-programmes and their duration; elementary psychology and pedagogics applicable to production training; methodological documentation; methods for evaluating the skills, knowledge and competence of trainees; role of the instructor in the training of new workers; safety measures and devices.

The training lasted twelve hours, with two hours for each of the above items. It ended with a two-hour examination. Trainees who passed the examination were appointed production training instructors by the plant chief engineer and were required to take updating courses every two years after appointment as an instructor.

1. V. Gračev, 'Instruktor učitsja i učit', *Professional'no-techničeskoe Obrazovanie* (*Moskva*), Vol. 22, No. 5, May 1965, p. 24–5.

The training these part-time instructors gave was additional to their main work in the plant and was paid for at a special rate.

Another example of training for in-plant instructors can be taken from the Federal Republic of Germany. The Economic Council of the Iron and Steel Industry in this country has organized courses of further training for a number of years for the instructors employed in undertakings in the industry. These courses provide for five weeks of full-time training for instructors, with a break of approximately fifteen days between the second and third weeks and the fourth and fifth weeks. The following topics are covered during the course: general aspects of vocational training; psychological bases of vocational training; the work-place and safe working conditions; practical training; how to assess work; impact of technical change on training; general technology.

The formal course lasts a total of 150 hours spread over the five weeks. The intervals between the second and third weeks and the fourth and fifth weeks are used to enable the participants to study some of the aspects of the training in depth, and to prepare a test exercise, designed to assess the extent to which they have been able to assimilate the subject method. The lesson which each participant is required to prepare is tried out first on the other participants and then given, in the latter's presence, to apprentices in one of the training workshops. Marks are given for performance with this test exercise and the assessment figures in the certificate given on completion of the course.[1]

Position in developing countries

In many respects the situation concerning instructor training is substantially different in developing countries from that in industrialized countries. The main difference lies in the public authorities' necessarily more active role. In developing countries, industry is not usually in a position to train its own instructors, except for such large and sophisticated industries as the petroleum industry. Employers' and workers' organizations have often not yet become strong enough to play a substantial and very active role in training in general and in the training of instructors in particular. As mentioned earlier, there is a great shortage of potential candidates for instructor training.

In these circumstances, it is essential in practically all developing countries for the public authorities to assume major responsibility

1. F. Berghaus, 'Training Officers and Instructors have a Mission', *Training for Progress*, Vol. 8, No. 2–3, p. 12, 2369 (ILO/CIRF publications).

for the training of instructors. They do so either by setting up their own training establishments or through specially created training bodies. In this way, the public authorities make a substantial contribution to industrial development. The provision of trained instructors for in-plant training will gradually enable industry to carry out more training functions and to become independent of outside bodies, at least for some part of the necessary training action.

Experience in organizing training for plant instructors in developing countries has shown that it is often both economically and technically desirable to provide for training for plant instructors and the training-staff of training establishments to be given in the same institute or centre. Multi-purpose establishments of this kind are particularly useful in countries in which training for skilled workers is organized in two parts: basic training in a school or centre and subsequent training in employment. Training patterns of this kind have been introduced, for instance, by the national semi-autonomous training bodies which have been set up in a large number of Latin American countries. These bodies not only provide for centres giving the basic training but also give undertakings technical advice and assistance in planning and developing training schemes: in addition they undertake the training of teaching-staff both for their own centres and for undertakings and provide basic training standards and syllabi to facilitate the training action of the undertakings.

The programmes of instructor training courses in developing countries often do not differ essentially from those used in industrial countries. There is, however, usually provision for greater emphasis on further general education and particularly, on technical skill upgrading. The inclusion of general education is necessary particularly in developing countries because of the frequently low level of general education among the bulk of the population. On the technical side, candidates for instructor training frequently do not have the full range of skills and knowledge required in their trade and may not in any case be fully up to date with the latest developments in it.

There is a general tendency in instructor training in developing countries for short-term training limited essentially to training in instructional skills to be replaced by more comprehensive courses: general education, technical and practical upgrading, training in the use of teaching methods and aids followed by periods of practical teaching under supervision. Short courses in instructional skills were given initially in many countries mainly as an emergency measure to give prospective instructors at least a minimum of

teaching skill. It was soon realized, however, that such training was not sufficient to make a good instructor out of a worker whose technical qualifications and general education were inadequate. It was also realized that, if the quality of instruction were to be raised, considerable time and effort had to be spent on the training of the instructors.

An example is given in the paragraphs which follow of an instructor training institute in Latin America. The example has been chosen to show how such an institution can develop into a multi-purpose institution; through such development, the capacity of the institution can be utilized to the utmost.

The National Institute for Instructor Training (Instituto Nacional de Formación de Instructores—INFI) in Huancayo, Peru, is an example of an institute which was originally founded for the purpose of training instructors and which then expanded its activities into related fields to become a multi-purpose institute. It began operations in 1964 with technical co-operation from ILO. The institute's original task was the planning and implementation of a programme of initial and further training for: vocational training and handicraft instructors within the framework of a programme for the integration of indigenous populations; for instructors giving basic education to adults; and for industrial instructors and plant foremen responsible for the training of newly engaged workers and the further training of workers already employed.

By the time ILO had completed its technical co-operation in Huancayo and following a number of modifications in the light of experience, INFI had been organized in four major sections: an industrial section; a section for service occupations and special types of training; a section for further training in artisan trades; and a mobile unit for agricultural mechanics. The institute's workshops provided over 100 work-places. Of these, sixty were in the industrial section (general and maintenance mechanics, forging and welding, woodworking, diesel and agricultural mechanics, and electricity) and forty in the artisan-trades section (metal, wood, leather, textiles) and for draughtsmanship training. Boarding facilities were available for most of the trainees and had been constructed partly by firms which sent members of their staff to the institute for training as instructors.

The work of the institute has continued since completion of ILO's technical co-operation. Close collaboration is maintained in connexion with the training of instructors for industrial occupations with the National Service for Apprenticeship and Industrial Work (Servicio Nacional de Aprendizaje y Trabajo Industrial—

SENATI). The emphasis is on the training of instructors for training units in undertakings and for the SENATI training centres which complement arrangements for training in undertakings.

The programme of training for industrial instructors lasts six months, in four phases. It begins with a period of technical and vocational upgrading to bring the trainee instructors up to the level of a broadly skilled worker in a medium-sized undertaking. For this phase the instructor trainees are rotated in small groups through the institute's workshops for general mechanics, electricity, forging and welding. They then spend four weeks on the preparation of production-line work and carry out the different operations involved in this work.

The second phase covers functional and pedagogical training. During this phase the future instructors are trained in the methodology of in-plant training. They also receive information on general industrial problems: systematic work organization, administrative and financial management, safety and quality control.

During the third phase, the trainee instructors' general education and ability to express themselves are further developed. This is done partly by group dynamics methods. The last phase of the instructor training programme takes place in undertakings under the supervision of SENATI specialists.

In addition to the training of instructors for industrial vocational training and for SENATI centres, INFI carries out numerous other tasks, either on a permanent basis (initial training and further training of artisans and training of agricultural mechanics) or on an *ad hoc* basis, often on the request of a ministry or other authority. Such activities include the training of instructors of practical work in isolated rural primary schools, the training of artisan electricians in rural communities; the training of supervisors of maintenance work in rural co-operative centres; the training of maintenance personnel for agricultural machinery; information courses on pedagogical methods for agricultural engineers in agricultural institutes; and assistance to rural communities in the repair and maintenance of electrical installations, of irrigation systems and of public-works equipment. These tasks are carried out by participants in the INFI instructor training courses in collaboration with local artisans.

In some cases, materials and tools produced by INFI have been lent to artisans in rural communities in order to encourage them to improve their working methods and the quality of their production. This action has led to the development and extension of a local market for the tools and equipment produced by the artisans.

INFI has also carried out studies and experiments with the aim of improving the preparation of raw materials or the utilization of new materials and thus improving production processes. Another of its activities consists in producing training-manuals and other didactic material, such as manuals and guides for in-plant training, for instructor training, a large number of technical manuals for a variety of occupations, and short films, filmstrips and slides.

The activities of INFI have contributed to the realization of the economic, social and cultural development programme of Peru. The industrial activities carried out in co-operation with SENATI have improved the operation of a number of undertakings and led to a higher output, a better utilization of equipment and a lowering of production costs. By 1967, some thirty undertakings had established special training-units, manned by instructors trained through INFI. Satisfactory results have been achieved in the rural sector and in community development among the indigenous populations.[1]

TRAINING OFFICERS

FUNCTIONS, QUALIFICATIONS AND RECRUITMENT

The functions of training-officers (also known as training-managers or -directors) and the qualifications required of them are still relatively ill-defined. The text of paragraph 41 of the ILO vocational training recommendation (No. 117 of 1962) is one of the most comprehensive and precise outlines available of the functions of training-officers (or departments). It reads:

'The functions of departments or persons responsible for training should include:

(a) suggesting training policies;
(b) ensuring in consultation with the departments concerned that training schemes are prepared;
(c) participating in the selection of trainees;
(d) ensuring the training of instructional staff;
(e) supervising training within the undertakings;
(f) making arrangements on behalf of the undertaking concerned for any instruction that he has to be given outside the undertaking and for the co-ordination of such instruction with that given within the undertaking;
(g) establishing and maintaining progress records of trainees;
(h) ensuring that the training takes proven methods into account;

1. Document VTB/D.34/1967: 'Instituto Nacional de Formación de Instructores, Huancayo, Peru'; Geneva, ILO, 1967.

(i) undertaking, encouraging or sponsoring research and follow-up studies to ensure that training is efficient and up-to-date.'

However, even the above text is not complete. It does not, for instance, specify either that a training-officer may also be required to give at least some of the training himself or that he may work for a group of undertakings, for example, in group training schemes. These possibilities should be taken into account in considering the functions of training-officers.[1]

Although the training-officer in an undertaking is usually considered as a member of management, his place in the organizational structure is not clear. In some large undertakings he may rank among the top managers; in others, and this seems to be the most frequent practice, he operates somewhere at the middle level of the hierarchy. The vague expression 'somewhere' has been used deliberately because it reflects the actual situation.

The lack of uniformity regarding a training-officer's place in the organizational structure was brought out in a study undertaken in the Netherlands. This study covered eight firms in the metal trades and mechanical engineering industries operating recognized apprenticeship programmes. It showed that in four of the firms, the programmes were the responsibility of a staff official (usually in the personnel department); in the other four, they were carried out by a line employee—a supervisor. It was found also that the organization of the programme varied according to whether a staff or a line employee was responsible.

In most of the firms, the management considered that training was best carried out under the aegis of the personnel department. Opinions were divided, however, as to what the responsibilities of the training-officer should be. Where job descriptions had been established, they rarely tallied with what the training-officer concerned did in practice.[2]

The absence of a typical job description for the training-officer and the widely varying functions which are attributed to him in different undertakings make it difficult to establish a generally valid list of qualifications which a training-officer should possess. It is obvious, however, that he requires a thorough knowledge of training systems and methods, of pedagogical and didactic principles, of youth and adult psychology, of learning theory and of general educational systems; and a comprehensive knowledge of the undertaking in which he works and particularly of its personnel

1. They have been included in the definition on page 19.
2. Putnam Cramer, J. W. 'De Bedrijfsleermeester', *Mens en Onderneming* (Groningen), Vol. 22, No. 4, 1968, p. 202–12.

structure, its organization, its production processes, and the objectives and policies of management. The training-officer should also have the ability to deal with all types and categories of people—young and old, men and women, workers, supervisors and managers. It is also important that, on recruitment, he should already have teaching experience.

It will be appreciated, in view of the situation outlined above, that the sources from which training-officers are recruited are extremely varied. Many of them have come up from the ranks of instructors or of teachers in vocational schools or undertakings; some have a broad educational background up to university-degree standard; others again have a specialist engineering or scientific background. The type of person selected as training-officer depends to a certain extent on the size and type of undertaking and on the importance, quantitatively and qualitatively, of the training function in the undertaking.

TRAINING

The expert group convened by ILO in 1969 from both industrialized and developing countries to discuss the training of teaching-staff for industrial training schemes[1] came to the conclusion that training for all personnel concerned with the planning and organization of training schemes in a management or advisory capacity (i.e. including training-officers) should provide for them to acquire some knowledge of the following: human resources development and its role in over-all development; methods of planning vocational training; economics; sociology; psychology and pedagogy; organization and administration of training; personnel management; training costs; teaching methods; methods of checking the standards reached on conclusion of training; and evaluation of training productivity.

The experts also considered that provision should be made for training-officers to receive further training as necessary to enable them to improve their work, to keep up to date and to qualify for promotion. They should also be given opportunities to participate in meetings and seminars dealing with topics relevant to their work.

Position in industrialized countries

As a natural consequence of the various uncertainties described in the preceding section, there are few standard training programmes

1. See footnote, page 118.

as yet for training-officers. Two examples of training courses are given below to illustrate possible ways of organizing such training. One is taken from the United Kingdom where, under the influence of the Industrial Training Act 1964, discussion of the functions, qualifications and training of training-officers has been particularly lively during the last few years. This example is concerned with initial training. The second example comes from Poland and covers a scheme of further training.

In the United Kingdom, one of the first activities of the Central Training Council established under the 1964 Industrial Training Act was to set up a committee which was to consider and make recommendations in connexion with the recruitment and training of training-officers. In its first report, it laid down recommendations for introductory courses for training-officers, designed to meet the immediate need arising from the Act's impact on industry. These courses were designed to provide an insight into the training functions and the role of the training-officer, for potential and recently appointed training-officers, who would normally have had some industrial experience.

The syllabus of the course prescribed by the committee is given in detail in Table 2. It comprises a minimum period of 120 hours' instruction in college, and was to be organized on a sandwich basis over a period of at least six weeks: two periods of two weeks each with an interval of at least two weeks of practical project work between them. It was recommended that courses should be residential and full-time.

Project work was to be regarded as an integral part of the course and be planned in consultation with the trainee's employer. It should be supervised by college staff and trainees should have the possibility of returning to the college for help and guidance during the industrial period.[1]

Since the committee's recommendations were published, a large number of introductory courses have been organized for training officers by different colleges and universities. Most are firmly based on the committee's recommendations although details vary.

The committee also recommended that the introductory courses should be followed by supervised practical experience and by appropriate specialized further courses. A second report produced in 1967 offered further advice on such matters as the work of training-officers, sources of recruitment and the selection of training-officers, their in-company as well as external-course training,

1. Central Training Council, Committee on the Training of Training Officers, *Training of Training Officers, Introductory Courses*. London, HMSO, 1966.

TABLE 2. Course content of introductory course for training officers (United Kingdom)

Main topic	Related syllabus subjects
1. *The training function* (general, 3 hours; related subjects, 9 hours)	
Role of the training-officer and others, in: (a) assessing training needs; (b) formulating and implementing programmes; (c) assessing effectiveness of training	Organization structure, including roles of managers, supervisors and specialists Management structure and processes of management Industrial relations Communications in the organization Sources of information Post-introductory training courses available
Basic skills and techniques (general, 2 hours) Analytical techniques Oral and written communications Social skills	
2. *Assessment of training needs* (general, 3 hours; related subjects, 12 hours)	
Social and legislative considerations	Industrial Training Act, Industrial Training Boards; requirements of professional bodies; safety
The firm's operations	Ergonomics; technological development; training for versatility; quality standards
Staff required	Manpower budgeting and planning; setting training targets
Individual development	Recruitment and selection methods Public education and examination systems
Specific skills and techniques (10 hours) General methods of observation and fact-finding; principles of job analysis Job analysis as applied to certain areas (e.g. choice of four from operator, apprentice, clerical, commercial, sales, supervisor, manager training, according to student needs) Interviewing (general and for selection)	

Main topic	Related syllabus subjects
3. *Formulating and implementing programmes* (general, 2 hours; related subjects, 28 hours)	
Preparing recommendations	Programme and syllabus design; day and block release; on- and off-the-job training
Administration and control	
Training the training-staff	Training committees; work relations
Instructing techniques and aids	Design and layout of training centres, workshops and 'stations'
	Preparation and use of training records
	Trainee guidance, counselling, welfare
	Instructor selection and training; assessment of instructing performance
	Training within industries (TWI)
	Principles of learning; motivation and incentive
	Methods for the older worker
	Range of instructing techniques
	Visual and other aids to learning
Specific skills and techniques (10 hours)	
Report writing	
Interviewing for appraisal and counselling	
Practical skill in use of more common techniques (particularly lecture, questioning discussion, chalkboard)	
4. *Assessing training effectiveness* (general, 2 hours; related subjects, 7 hours)	
Validation	Application of scientific method to information from training records, supervisors, managers, specialists, trade and other tests
Evaluation	
	Current research in training
	Appraisal for personal development
	Cost-analysis procedures
	Measurement of effectiveness against cost; cost-comparison of methods and approaches
Specific skills and techniques (2 hours)	
Use of simple statistics	
Technique of observation	
Accounting techniques	

TABLE 2 (*contd.*)

Main topic	Related syllabus subjects
5. *General* (30 hours)	
Visits (6 hours)	
Project reporting and discussion (9 hours)	
Private study (9 hours)	
Introduction, open forms, closure (6 hours)	

and the selection of external courses. During 1970, a survey of courses for training-officers showed that colleges are increasingly offering short, specialized, follow-up courses for more experienced training-officers, each lasting a few days and dealing intensively with a single aspect of the training function.

The example from Poland is concerned with a course of further training for persons responsible for organizing in-plant training—i.e. for training-officers—which was launched in 1968 by the training centre set up for workers in the chemical industry by the Polish Ministry for the Chemical Industry.

The course is divided into two stages, each lasting one week, full-time. The syllabus of the first stage consists of three parts:

1. Elementary psychology and teaching methods suitable for adults. This instruction is to train the organizers in the process of selecting teachers and instructors for the in-plant training of chemical workers (including upgrading and updating).
2. Principles of drawing up training syllabi and guidelines to help the teachers prepare their lessons and the instructors to prepare instructions to be given to the trainees during the practical training periods (the organizers need to be familiar with these principles as they have to inform part-time instructors about the subject matter of the training syllabi and suggest the teaching methods and aids which they should use).
3. Knowledge of the administrative, financial and legal aspects of organizing training; instruction on the legal aspects consisting of detailed explanation of the various laws governing in-plant training, in order to ensure that they are correctly interpreted by the organizers.

This first stage is followed by a break of five weeks during which each participant in the course has to prepare a lecture on one of a series of proposed subjects. The list may include such topics as the organization of practical training in the undertaking in which a participant

works and suggested improvements, or the organization of a course on safety measures for his undertaking, its subject matter, the teaching methods to be used, etc.

The second stage consists of lectures by the participants, each lecture being followed by discussion. One of the main aims is to give participants an opportunity to exchange views and compare experiences over as wide a field as possible. During this stage, the organizers are also taught how to supervise implementation of the in-plant training syllabus (for example, by attending lessons given by the teachers and instructors) and to assess its effectiveness.[1]

Position in developing countries

In developing countries there is still relatively little provision for the training of training-officers. This is understandable as in many of these countries systematic in-plant training is still at an early stage of development and training units in undertakings are too few in number for the need to organize special courses for training-officers to have been recognized or given priority. The function of training-officers in an undertaking often does not exist or is not considered necessary.

However, the rapid and continuing expansion of systematic in-plant training which is taking place in many developing countries has greatly increased the need for qualified training-officers. A start has been made in a number of these countries to organize special courses for them. In Brazil, courses are organized, for instance, by management associations, technical colleges and the National Industrial Apprenticeship Service (*Serviço Nacional de Aprendizagem Industrial*—SENAI). One such course in a technical college includes: human resources development, general economics, national economy, role of human resources in development, general and vocational training planning, sociology, sociology and pedagogy of young people and adults, didactic principles, teaching methods and aids, administration and management of schools and centres (as regards personnel as well as equipment), financial problems, control of vocational training results, and evaluation of training productivity.

In the Arab Republic of Egypt, courses are provided by the Vocational Instructor Training Institute for training-directors. These courses place emphasis on management techniques, and the

1. B. Chmielewska, 'Doskonalenie organizatorów kształcenia w resorcie chemicznym', *Oświata Dorosłych*, Warszawa, Vol. 13, No. 2, February 1969, p. 92–7.

training-directors must attend 12 a week throughout a period of three months.

Emphasis is also placed on management techniques in the various seminars for training-officers and other senior training-staff which have been organized in Latin America under the auspices of the ILO-sponsored Inter-American Research and Documentation Centre on Vocational Training (*Centro Interamericano de Investigación y Documentatión sobre Formación Profesional*—CINTERFOR). These seminars are conducted in conjunction with the central training bodies in the Latin American region which join their resources in CINTERFOR to improve training both within the region and for their individual countries.

Individual central training bodies in the region have also conducted special courses for plant training-officers when assisting in the development of systematic in-plant training schemes. One such course in Peru, conducted under SENATI with the collaboration of an ILO expert, was for plant executives with a view to the establishment of plant training units and the training of the staff responsible for them. It included the following topics among others: information about the assistance which can be provided by SENATI, in the development of plant training units and about SENATI's structure; determining training needs; job analysis; preparing a training plan; training instructors; and supervising and evaluating training.

Courses of this kind, held in Latin America and elsewhere, are often supplemented by the provision of training documentation and guidelines to help training-officers in their work. Courses are also available abroad, for instance those conducted by the International Centre for Advanced Technical and Vocational Training in Turin.

However, all the various efforts made so far have done no more than touch the fringe of the problem. There remains an enormous amount to be done to develop courses which take account of the often rather special functions of training officers in developing countries and to provide for their further training as necessary to adjust to changing requirements.

SUMMARY AND CONCLUSIONS

The increasing importance of training in undertakings in both industrialized and developing countries calls for a constantly growing number of well-qualified training staff in undertakings. There are two main categories of undertaking training staff:

instructors who give essentially practical training and training-officers who are responsible for the planning, administration and organization of training in undertakings.

Industry in industrialized countries is often in a position to meet at least a large proportion of its needs for competent training staff, and particularly for instructors. In developing countries, industry is usually able to do little in this respect and in organizing training in general. The public authorities—or the central training bodies which the public authorities have given primary responsibility for training—therefore have to play a very active role in the provision of training for undertakings' training-staff and in assisting generally in the development of in-plant training schemes.

The qualifications required of instructors do not differ greatly, regardless of whether they work in vocational schools, training centres, or undertakings. It is often possible to train both types of instructor in the same establishment, and this is frequently desirable.

Instructor training should preferably be given before an instructor takes up his duties. As this is not always possible and as emergencies have made it necessary for undertakings to employ workers with adequate technical qualifications as instructors without previously giving them training in teaching methods, in-service training in such methods should be given as soon as possible after they commence instructional work. In-service training is also necessary for all further training of instructors—mainly for their upgrading and updating, both technical and pedagogical.

Where it is possible to recruit persons who are technically fully competent as prospective instructors, it may be sufficient for their training to deal only with teaching methods, the use of training aids, basic principles of youth and adult psychology, pedagogics. But some further technical instruction, especially theoretical, may also be necessary. In developing countries, where resources in technically qualified personnel are very scarce, it will almost always be necessary to combine teacher training for instructors with technical upgrading and further general education.

In the case of training-officers, their functions, status and desirable qualifications are still not very clear, although staff responsible for planning, administering and organizing training schemes in undertakings has existed for a long time in industrialized countries. In the past, even in these countries, training-officers were often promoted direct from the ranks of instructors or vocational teachers or appointed from among technical or managerial staff members without, in either case, being given specific training for training-officer work. It is only recently that a distinct profession of training-

officers has emerged. While greater attention is now being given to training for this profession, relatively few training programmes exist for training-officers which can be considered as really standard ones.

Examples have been given of schemes of training for both instructors and training-officers. This has been done not with the intention that they should be considered as models, but in order to illustrate some possible approaches. Each country, each industry, and possibly even each undertaking, will have to work out the kind of training which is best suited to local conditions and requirements.

Reference has been made in the text to the assistance provided by certain regional organizations such as CINTERFOR in connexion with the training of training staff and to technical co-operation by international organizations, including the work of the ILO-sponsored International Centre for Advanced Technical and Vocational Training in Turin. The regional and international organizations and bodies concerned with vocational training all place considerable emphasis on the training of training staff and have made, and are making, a substantial contribution to improving their training, particularly in the developing countries.

However, and in spite of all the efforts of individual countries, of groups of countries, of regional and international organizations and other institutions, an enormous amount remains to be done. Action must be taken urgently: to determine the most appropriate ways of organizing both initial and further training for instructors and training staff in countries at different stages of development and in undertakings of different sizes and character; and to define clearly the functions of training-officers in both industrialized and developing countries. In taking this action, national, regional and international bodies will have to work together, in research, in experimental action, in the exchange of information, and in the provision of standards and guidelines.

CHAPTER VI

TECHNICAL TEACHER PREPARATION

The technical teacher as defined in this study, teaches technical theory and in some cases laboratory work on the advanced secondary or lower tertiary level. He is, then, responsible for the theoretical preparation of technicians, usually on the higher level. However, he may teach future technicians on the lower or ordinary level, and here his role is very similar or even identical to that of the vocational teacher. For, whereas in some countries the vocational teacher and the vocational instructor are indistinguishable, in others this applies to the technical teacher and the vocational teacher.

It is generally agreed that the technical teacher should possess a university level education. For example, the Unesco recommendation on technical and vocational education and training states that: 'The teaching-staff for the education of technicians should possess either a degree or a higher technicians' qualification in an appropriate field and should have had industrial or comparable experience in their particular discipline.'[1] Further, ILO recommends that 'teaching-staff responsible for theoretical technical courses should be recruited, according to the type of training involved: (a) from among persons who have been trained for and have had several years' practical experience in the occupation they are to teach, in addition to having a sound theoretical knowledge of it and a good background of general education, as well as teaching ability; or (b) from persons with appropriate practical experience as well as a degree or diploma awarded after appropriate training in a university, technical institution or teachers' training college or by a body approved by the public authorities.'[2] And the Committee for General and Technical Education of the Council of Europe stated in 1970 that 'in all events, teacher training (for teachers of theoretical technical subjects) could not achieve its purpose unless based on a

1. Unesco, *Recommendation concerning Technical and Vocational Education*. Article 67.
2. ILO, *Recommendation concerning Vocational Training*. Article 62.

sufficiently high level of academic and technical training: university level or the equivalent'.[1]

While there is general agreement on the necessity of university education for the properly qualified technical teacher, no such concensus exists concerning the amount and kind of pedagogical studies appropriate. All three organizations cited above agree on the principle that technical teachers should have received some professional preparation which includes theory and practice. In actuality, however, provision for this preparation is either disorganized or non-existent in most countries. Whereas a number of special pedagogical programmes now exist for the education of vocational and workshop teachers, few specialized programmes exist for the education of technical teachers.

The relatively light emphasis placed on the professional training of technical teachers stems from a number of reasons. Primarily, it is considered that the technical teacher responsible for theoretical subjects must first and foremost have an excellent grasp of his subject matter which, given its nature, requires lengthy formal studies. Armed then with a high level of theoretical knowledge and some practical experience in industry, the technical teacher is often left to his own devices to discover how best to organize and present material to his students. Also, since the technical teacher usually teaches on a higher academic level than the vocational teacher, it may be considered that he will be teaching more highly motivated students and will then have no need of exposure to psychology, learning theory or pedagogical methods. This reasoning may hold up for the post-secondary level, but it is doubtful for the technical teacher on the *lycée*, or technical school level, whose students are not mature adults but adolescents who must not only be trained as technicians, but educated as well.

Yet another reason, and perhaps the most important, for the lack of provision for technical teacher education, may be adduced. Vocational education grew out of older traditions of apprentice or craft training: the need for skilled workers and what we now call ordinary or junior technicians is not new. But with the development of twentieth-century technology, the need for middle-level technical personnel occupying positions somewhere between the skilled worker and the engineer or scientist has mushroomed. In industry the technician often acts as the liaison between the engineer and the worker. He translates the plans and ideas of the engineer into concrete terms so that the worker may execute the project. Because

1. Council of Europe, Committee for General and Technical Education, *Course on Training and Further Training of Teachers in Technical Schools, Report*, 1970.

the category of technician is a relatively new phenomenon, the means of preparing teachers for this category are still in the experimental state even in the most highly industrialized countries, the United States being a prime example. Technician training, according to a recent report, is the expanding area of technical education,[1] much more concern therefore is required for the preparation of teachers in this field.

To illustrate the complexity of technician education and hence the preparation of teachers of technicians, an indication of the enormous range of activities engaged in by technicians may be helpful. In the first place the technician may be in a job requiring little more technical knowledge than that of a skilled craftsman. Or, he may be working very closely with a scientist or engineer engaged in very high level research. In industry, for example, the technician may be in one of the following areas on one of a number of levels: design, research, development, testing, production, operation and maintenance, inspection, and technical sales. A technician might work with data processing, quality control, cost estimation, or might be a jig and tool designer, a draughtsman, a plant or site overseer, a laboratory assistant in the medical or agricultural field, or a technical salesman. Moreover, middle-level management in the commercial, banking, administrative, hotel and tourism, and home economics fields may be called technicians. Obviously, then, the term technician remains ill defined in that it is general in nature, and applies to a wide range of fields and to a wide range of competencies within them. Not only do technicians perform numerous functions on numerous levels, but new types of activity demanding technicians are being constantly created, and so the usual definition of the technician as being an industrial occupation midway between the skilled worker and the engineer in an ascending line of skills and education is not necessarily valid.

With the increasing demand for technicians in various fields able to adapt to rapid change, and with the increase in technical schools, institutions and technical education in comprehensive schools, there is an increasing need for good teachers. But recruiting and preparing these teachers, in requisite number and quality, remains a problem in many countries.

Where professional studies are required for the technical teacher, he most often takes post-graduate pedagogical courses while either in industry or in teaching so that he may fulfil minimal requirements. Frequently pedagogical courses are offered as possible options in a

1. Hugh Warren, *Vocational and Technical Education* (this series, VI). Paris, Unesco, 1967, p. 105.

general or technical university which the student may take concurrently with an engineering programme. We have seen one example of this sort in the Technion Israel Institute of Technology. The major problem involved in such a programme was also mentioned: usually students are capable of, and choose, engineering research or management jobs rather than teaching as the career most lucrative in the future. In the United Kingdom and the United States there is little distinction between technical and vocational teachers and thus the pedagogical programmes are the same—either attached to college or university studies, or as post-graduate full-time pedagogical programmes. The same is true to a certain extent in Yugoslavia, where the College of Industrial Pedagogy provides one course for both vocational and technical teachers and another for workshop teachers. Very few countries have specific programmes for the preparation of technical teachers: France, the Federal Republic of Germany, the German Democratic Republic and the U.S.S.R. are notable exceptions with institutes of university level offering programmes leading to both high technical and pedagogical qualification.

The technical teacher is, then, in a rather special position, and appropriate programmes for his professional preparation are often not clearly worked out. What is clear, however, is that the technical teacher must not only have a thorough grounding in the theory he will be teaching, but he must also be able to closely relate that theory to practice, so that the future technicians will be able to comprehend the engineer, executive, or researcher, on the one hand, and communicate with the worker on the other. Also, in general the level of theoretical comprehension of the future technician, because of interest and aptitude, is lower than that of the future engineer or scientist. The technical teacher must, then, know how to gear his theoretical teaching to the level and aptitudes of his students, and how to present his material most effectively to them. Pedagogical training in relation to the particular problems of the technical teacher will enable him to fulfil his function more effectively from the beginning of his career.

Let us attempt to define more clearly the functions of the technical teacher in the technical school or *lycée* on the advanced secondary level. His role depends upon what he is preparing his students for, and therefore the technical teacher may generally be said to prepare students for one of three routes. He may be preparing technicians on the ordinary or middle level in a terminal course in the school. At graduation this student will immediately enter employment. Or the technical teacher may be preparing the student for further

technical education which will qualify him as a higher technician, either immediately after graduation from a technical institute or after several years' employment in industry. And thirdly, the technical teacher may be preparing students to enter technical universities in an engineering programme. For a clearer picture of the technical teacher's possible functions see Figure 5 overleaf.

A good case could be made for recruiting technical teachers from three groups since they might perform several rather different functions. For the theoretical preparation of future university students a graduate engineer might best perform the function. For the preparation of a student for schools preparing higher technicians, the teacher need not be a graduate engineer, but perhaps a superior technician, with a broad general education, pedagogical training and experience in employment as a technician.[1] Alternately, this type of teacher might have an applied engineering diploma, but in this case should have considerable experience in his field so that he will understand the nature of the future employment of his students. Teachers in terminal technical programmes might best be higher technicians, again with broad general education and pedagogical training, but with considerable practical knowledge of the special technical field. For they will be training technicians for immediate employment and the thrust of their teaching must therefore be practical.

The problem of the ideal teacher in the post-secondary technical institution is somewhat similar. Often this type of institution is looked upon as a prelude to university studies, or aspires to give instruction on the university level. Although the quality of instruction given should not preclude a student's entrance into a university engineering programme if he has the interest and aptitude, this should not be seen as the primary function of the post-secondary technical institution. The modern world has at the moment far more need of qualified technicians on all levels than of graduate engineers. The post-secondary technical institution should be seen as performing a necessary and useful function, in and of itself, differing from the university not in the *quality* of its graduates but in the *kind* of graduates it produces. Teachers in these institutes should certainly have had higher studies on the university level. Pedagogical studies are also desirable in order that the future

1. This line of argument was pursued by Dr K. S. Julien, a West Indian educator, in a paper 'Curriculum and Teacher Training' presented to the Unesco/UWI Seminar. See Unesco/UWI 'Report of the Seminar on Curriculum and Teacher Training held at the University of the West Indies, St. Augustine, Trinidad, 29 August to 6 September 1967', January 1968, 41 p. and appendices.

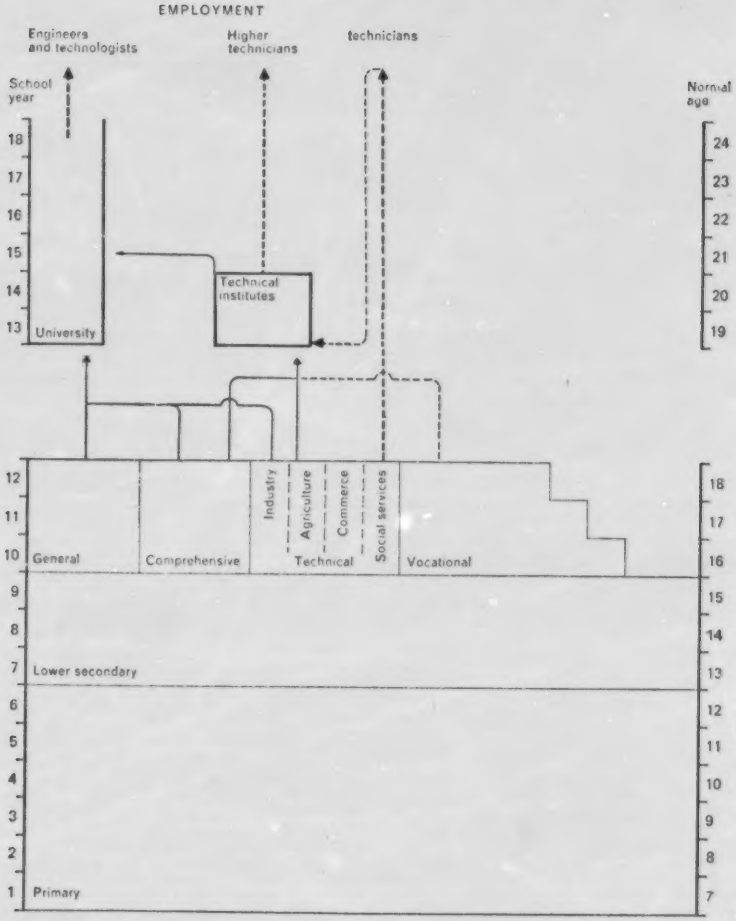


FIG. 5. A model educational structure for technician education and training.

teacher learns appropriate teaching methods, though perhaps less psychology is necessary than in the case of the technical teacher of adolescents. Again, the largest problem is the one of the practical experience of the teacher. If he is an engineer, he might have little knowledge of the type of work the higher technician will be required to do, and hence there is the danger of his teaching being too theoretical and in the end not suited to the needs of his students. As in the case of the teacher of technical schools, perhaps the recruitment and preparation of technical teachers to fulfil different functions should be considered: the teaching of higher theoretical courses; the teaching of theory, but relating it very closely to the practical application of the subject; and the teaching of both theory and practice.

The problem of producing technicians and their teachers is perhaps even more thorny for developing countries. Technicians are the most sorely-needed group of industrial, medical, commercial and agricultural personnel.[1] Yet it is in just this area that there are fewer teaching facilities. In the recent past, very few had access to education, and those who did considered university education as the only form of higher education. Thus once the principal of technical education was admitted, technical studies naturally, in this context, pointed to university studies. As a result there has been a tendency to upgrade post-secondary technical institutions to university level, using university trained staff and thus achieving a higher status for these institutions. Despite the advantages gained, often there is the less happy consequence that too many engineers and top-level personnel in relation to the economy have been trained, and few middle-level personnel are available. Thus the establishment of secondary and post-secondary technical institutions or streams in comprehensive schools designed to train competent technicians is a major priority, and perhaps the most difficult area of technical education in developing countries. Provision has been made for training engineers either at home or abroad; a number of successful programmes of vocational education are in operation.

In this chapter, various provisions for the training of technical teachers in industrialized countries will be discussed. We will then look at some of the programmes now in operation in several developing countries, and will study more closely the problems, the areas of success and the areas of failure.

1. This becomes very evident indeed in a colloquium for members of the Colombo Plan held in Singapore, May 1969. See Colombo Plan Bureau, op. cit.

TECHNICAL TEACHER TRAINING IN INDUSTRIALIZED COUNTRIES

Industrialized countries are for the most part far from having developed adequate programmes for the training of technicians, and even farther from dealing successfully with the problem of how to train technical teachers in the numbers and quality required. For with the increasing demand for middle-level manpower in all sectors and the rapid changes in technician fields, the general requirements of technical education are in a state of flux. Therefore the requirements for appropriate teacher preparation are constantly changing as well.

TEACHERS OF INDUSTRIAL TECHNICIANS

United States of America

In the United States, technicians are trained and educated in several different types of institution:[1] public junior and community colleges, technical institutes, area technical and vocational schools, and divisions of four-year colleges and universities. Thus, technician education takes place in the two years immediately following 12 years of general schooling, although such programmes may be adapted to the upper levels of secondary schools as well. These programmes have experienced a large growth in recent years owing to the ever-increasing demand for competent middle-level personnel.

Technical as well as vocational teachers are trained in university-level institutions and the minimum academic requirement is tending toward the bachelor's degree or its equivalent. In most cases the preparation of teachers for the post-secondary technical institutions is in-service rather than pre-service, and teachers are recruited from either employment or from secondary school teachers and their programmes designed accordingly. Experience has shown, however, that teachers recruited directly from four-year engineering programmes, even with the required pedagogical preparation, are not necessarily the best teachers of technicians.[2] There is now a trend toward recruiting graduates of the two-year technical programmes who have spent three to five years in employment and who have

1. See p. 39 for the United States educational structure.
2. United States Department of Health, Education and Welfare, *Criteria for Technician Education, A Suggested Guide*, Washington, D.C., U.S. Government Printing Office, 1968, p. 32–3.

continued their technical education to the professional or degree level. These teachers are more likely to understand the special requirements and objectives of technical education than their more academically oriented counterparts. It should be noted, however, that there is great diversity among the various states and that common patterns are difficult to distinguish. Furthermore, pedagogical qualification is not a necessary prerequisite in many post-secondary institutions, although certain standards concerning faculty qualifications are required by the states.[1]

The technical education programme at the Oklahoma State University is a good example of the kind of programme for technical teacher training which is currently of great interest in the United States, although not as yet widespread.[2] This programme leads to the degree of Bachelor of Science in Technical Education, and a programme leading to the Master's degree is available for those who wish to continue their studies. This programme is designed primarily for graduates of the two-year technician training programmes given in junior colleges and technical institutes which are sanctioned by the Associate degree. Students may enter the programme directly after these studies or preferably after having obtained some work experience as a technician in the field he plans to teach. Because the student must have completed the first two years of university work before entrance, the length of the programme corresponds to two full-time academic years.

In order to obtain the B.Sc. in Technical Education, the future teacher must accumulate course credits in several different areas: general humanities, social science, education subjects, advanced technical subjects, mathematics and science and technical education, and must take suitable elective courses in addition. If, as occurs in special cases, a student enters the programme with a science or pre-engineering background, he may be required to take specialized technical courses at the Technical Institute, a division of the university, located on the campus. The total number of credits required for the degree are established on the basis of a four-year degree programme. The credits obtained in the junior college or technical institute in specialized and related technical courses, as

1. There are indications that this is changing and certain federal guidelines encourage post-secondary teachers to achieve teacher qualification. See for example U.S. Office of Education, *Forest Technology, a suggested two-year Post High School Curriculum*, Washington, D.C., U.S. Government Printing Office, 1968, 142 p., one of a series of guidelines published for various fields in technical education.
2. See United States reply and appended documents to Unesco questionnaire on draft study, op. cit., and various documents provided by the Oklahoma State University.

well as some credits obtained in general courses are deducted from the total, and the student's course of study planned accordingly. A general curriculum outline may be found in Appendix IV.1. As may be seen from the curriculum, the core pedagogical courses are designed as a structured sequence of courses providing an introduction to technical education, occupational analysis, fundamental teaching techniques and the essentials of curriculum and programme planning. For those planning to teach in institutions requiring state teacher certification, four other courses are required: practice teaching, Oklahoma history, biological science and educational psychology. Opportunities for practice teaching are available in the School of Technology attached to the campus as well as in other technical institutes, junior colleges and area vocational and technical schools.

Yugoslavia

Yugoslavia provides an example of a country in which there is no real distinction between vocational and technical teachers—all teachers in secondary schools are required to have a university degree, just as all studies on the post-secondary level form a part of the higher education or university system, and thus the teaching staff is recruited accordingly. University-educated teachers teach only theory, while workshop teachers are responsible for the practical aspects of vocational and technical education.

The High School of Industrial Pedagogy is one institution in Yugoslavia specifically designed for the education of vocational and technical teachers.[1] This institution is very similar to the type of technical teacher training institution now prevailing in developing countries. The course lasts four years and combines general, technical and pedagogical education. Candidates for entrance must have completed secondary education, including four years in a technical school in the line of their specialization. For example, if applying to the mechanical engineering department of the High School of Industrial Pedagogy, a candidate must have specialized in mechanical engineering in a technical school. At the end of their studies, students must write a paper during a four-hour period; this thesis is then defended before an examining board to determine whether the degree will be awarded. Although students take courses in practical and theoretical pedagogy, no period of practice teaching is allowed for in the curriculum. Instead, after graduation the

1. It should be noted that Yugoslavia replied to the Unesco/ILO questionnaire in English using the term 'High School' to denote a tertiary institution.

student obtains a teaching post and remains on probation for two years. During this time he is expected to become acquainted with all functions of the school and to teach all those subjects in which he will take his teacher qualification examination. At the end of the period, the probationary teacher is examined by a board representing the educational authorities on educational legislation, school administration, and in his technical field. He must also prepare and defend a thesis and must prepare a sample lesson showing a firm grasp of methodology for the grade level he is teaching. In addition, the future teacher is required to work in industry during the summer months throughout his studies, thereby acquiring practical experience in his field.

Technical teachers trained at the High School of Industrial Pedagogy are responsible only for the theoretical courses in the secondary schools; workshop teachers are responsible for the practical aspects. The curriculum therefore tends to emphasize technical theory and methods of teaching technical subjects, rather than the acquisition of practical knowledge in the field. This is perhaps the weak point of the programme, for experience gathered for a few months each year in the summer does not really substitute for continuous experience over a longer period of time. On the other hand, the pedagogical training given is rather thorough and the teacher graduating from the High School of Industrial Pedagogy should have a fairly clear idea of how to teach technical subjects to adolescents and of the problems involved.

TECHNICAL TEACHERS OF AGRICULTURAL AND COMMERCIAL SUBJECTS

So far in this study the training of teachers for both agricultural and commercial subjects has been neglected. As stated in the introduction, to deal thoroughly with these fields would render the study too broad in scope and perhaps less useful. These are, however, extremely important areas for developing countries. Rural education, for example, tends to be considered a second-class education. If true rural development is to take place, the prerequisite conditions must be created: general economic development of the area including implantation of industrial and services related to agriculture and the trained personnel required to lead the development effort. Thus agricultural technical education has an important role to play. Furthermore, the need for good commercial education in developing countries has often been underestimated. If middle-level personnel trained in sales and services are not available, the products of a

country will not be sold and distributed, either at home or abroad, to best economic advantage. Two examples of technical teacher preparation in developed countries, one from each of these fields, might prove useful for purposes of comparison with the industrial field. ENSSAA in France and the programme for commercial teachers at the University of Zurich, Switzerland, will therefore be discussed in the following pages.

AGRICULTURAL EDUCATION: *France*[1]

In recent years France has instituted a centre for the training of teachers of agricultural technology. The centre, located at Dijon and opened in 1967, is known as the École Nationale Supérieur des Sciences Agronomiques Appliquées (ENSSAA). The institution is under the authority of the Ministry of Agriculture, although representatives from the Ministry of Education sit on the governing council. ENSSAA trains both the superior *cadres* of the government agricultural services as well as administrative personnel and teachers for the upper level courses in the agricultural *lycées* and other educational establishments. Attached to ENSSAA is the Institut de Formation des Professeurs Certifiés de l'Enseignement Agricole, which trains teachers of scientific and economic disciplines related to agriculture in the agricultural *lycées*. By this arrangement, both government agricultural engineers responsible for advising and working with various agricultural groups throughout the country and abroad and teachers for all levels of agricultural *lycée* teaching are trained.

The programme at ENSSAA lasts two years. After the first year, students are awarded the *diplôme d'agronomie approfondie*; after the full course of studies, the *diplôme d'ingenieur d'agronomie* with mention of the special option taken at ENSSAA. If a student successfully completes the course, he is obligated to spend at least five years in government service. Only after considerable service will the ENSSAA graduate be responsible for teaching the superior-level courses in the *lycées*—for he must have passed through the various echelons in the third of three grades of agronomy engineers and have obtained the rank of engineer-in-chief or the second grade. These teachers are also responsible for various activities in the region served by the *lycée* and thus combine teaching and community activities.

The students at ENSSAA are recruited from various groups. About 90 per cent of the recruits are drawn from the ranks of

1. France, reply to 1968 questionnaire.

students at the National Institute of Agronomy and other higher schools of agriculture who have a higher diploma in general agronomy. The remaining 10 per cent of each entering class possess another type of diploma related to agriculture. No more than one-sixth of those entering class may be drawn from the ranks of certified teachers of agricultural education with three years' service, and no more than one-sixth may be drawn from governmental agricultural engineers with five years' service. Also, candidates must prepare for and be successful in a general entrance examination. As a result of recruitment qualifications and the ENSSAA programme, the total length of preparation is five to six years.

The curriculum is pedagogical and technical although some general courses, e.g. modern languages, are required. Students must take certain core courses designed to give the future teachers and government engineers a common background in the social sciences, including problems in adult education and pedagogy, and in administrative techniques. Outside the core courses, students follow one of three options for specialization: animal production, vegetable production and agricultural economics. The programme includes practical work in agriculture as well as a total of six weeks of observation and practice teaching in a *lycée*.

The syllabus of the pedagogical programme, because of its combination of psychology, pedagogical theory and pedagogical practice, might serve as a model for the preparation of technician teachers for the higher secondary and post-secondary levels. Where the study of problems specific to agriculture is indicated, the study of questions related to industry may be easily substituted. (The pedagogical syllabus of ENSSAA may be found in Appendix V.1.)

Attached to ENSSAA is the Institut National de Formation des Professeurs Certifiés de l'Enseignement Agricole (INFPCEA) which offers a programme leading to the certificate of aptitude for teaching in the agricultural *lycées* (CAPLA). It is divided into two parts, the first comprising two years of theoretical studies; the second, one year of practical studies. The curriculum includes general, scientific, technical, economic and pedagogical studies.

Entrance to INFPCEA is determined, as in the case of ENSSAA, by examination. Students are recruited from four groups. Those who have been successful in the first year of higher agricultural studies and hold a certificate of this cycle, may enter directly the second year of theoretical studies. Three other groups of students must take the entire programme: those who hold the *baccalauréat* from an agricultural *lycée* or those who hold a technician's *brevet* and have

had a year of preparatory studies at a national school of agronomy or, thirdly, those who hold the *brevet* of higher agricultural technician. The average length of time for the total preparation is four to five years after the level of the *baccalauréat*. The length of studies at INFPCEA depends upon the level at which the future teacher is recruited.

After the two years of theoretical studies, students must pass an examination before being allowed to enter the last year of practical studies. During this last year the students fulfil their practical teaching requirements, and at the end, they are admitted to the final examination leading to the CAPLA.

The complex at Dijon, then, prepares technical teachers, administrators and inspectors, for the agricultural *lycées* as well as agricultural engineers for public services. Institutions of this type might well provide a model for linking education and rural development through the preparation of teachers of agricultural technicians.

COMMERCIAL EDUCATION: *Switzerland*

Although commercial education is certainly a very important form of technical education, it differs in a number of ways from technical education for industry, the main burden of this paper. Commercial education gained general acceptance far earlier than technical education for industry because it could more easily be grafted onto the general education system—the main skills required in the past being language and accounting or arithmetical skills. Commercial education now covers a broad range of skills and instruction including economics, management, marketing, etc. This type of education is given in an equally broad range of institutions ranging from introductory courses in lower secondary schools to post-graduate university level institutions such as Harvard Business School in the United States, or the Haute École de Commerce in France. Commercial education is at present a rapidly changing field primarily because of the increasing use of the products of technology in banks and commercial establishments.

Most teachers of commercial subjects, either in general education schools or specialized institutions, may be characterized as technical rather than vocational—the teachers of typing and shorthand or of vocational distribution being exceptions. Then too formal pedagogical training for this type of teacher was the earliest established for technical teachers.

For purposes of comparison with the preceding programmes

discussed, we shall look at the provision made for commercial teacher training in Switzerland.[1]

It is common practice in most developed countries that teachers of commercial subjects must have a university education or the equivalent. Pedagogical training is either integrated into the normal course of studies or is taken in a special institution after graduation. The University of Zurich provides a course of studies which leads to both a degree in economics and a diploma in commercial education. *The course of studies lasts eight semesters.* In the first three semesters, the student prepares for examinations in basic features of political economy, economic policy, statistics, and accountancy. After success on these examinations he then studies four semesters for the licentiates' examination which is composed of a written examination on theoretical and practical political economy as well as on one subject from among those in which he is examined orally. The oral examination includes the following subjects: theoretical political economy, financial science, general business economy, accountancy, and Swiss commercial law as well as one optional subject from: special business economy, insurance, Swiss economy, economic geography, Swiss Federal State Law, and operations research. In addition to the first seven semesters of study, the student must spend one year gaining practical experience in business. After the eighth semester the student must have three weeks teaching practice. In order to be admitted to the diploma examination for teacher certification, the student must have taken an active part in teaching seminars on commercial subjects and have regularly attended the course on commercial didactics and at least one course in either philosophy or psychology. The teachers' diploma examination consists of two papers in economic arithmetic and accountancy, presentation of two test lessons in two different levels of a commercial school, and participation in an oral examination with didactics professors.

As can be seen from the above discussion of the programme at Zurich, commercial teacher preparation can be rather easily conducted in conjunction with requirements for a degree in economics, or in other cases with degrees in business administration. The training of commercial teachers poses, on the whole, fewer problems than does the training of technical teachers of industrial subjects. To be sure, both need to have had experience employed in the field

1. The information on commercial teachers is taken from the report and documents of a course held by the Committee for General and Technical Education, 'Training and Further Training of Teachers of Commercial Education', Munich, Council of Europe, 1970.

in which they will teach. But, on the other hand, in the case of commercial teacher education, the problem of organizing teaching methods courses with special workshops for the purpose does not arise. That is, it is simply easier to organize commercial teacher preparation courses within the traditional college or university context.

CONCLUSIONS

The preceding discussion illustrates the variety of functions performed by the technical teacher. In the case of Yugoslavia, there is little distinction made between the vocational and the technical teacher, only one between the teachers of theory and those of practice. This situation is rather similar to that obtaining in the United States of America, as most secondary teachers in whatever subject are required to have at least the Bachelor degree, awarded after the first four years of university, with the result there is little distinction between the vocational and the technical teacher in terms of the academic level of his preparation. France provides one of the few examples of a programme designed to train technicians and engineers specifically for the teaching profession in institutions such as ENSET and ENSSAA. A further advantage to the French system is the training of future teachers on various levels of technical achievement. The disadvantage is that in the French system there is relatively little space for work experience in the field of future teaching, though of course the programmes do not preclude students from having had this experience.

Because in most countries the prime qualification for the technical teacher is a university degree or a degree from a comparable institution in the special technical field, often the pedagogical training as well as the practical experience of the future teacher in his field is overlooked or is minimal. It should be seriously considered whether or not the primary consideration in recruiting technical teachers for all levels of technical education should be the possession of a university degree in the technical specialty. Perhaps more attention should be given to the creation of post-secondary specialized institutions which would provide the technical background necessary for a higher technician and then develop teacher education programmes to degree level suited to this prior education. University programmes would provide the teachers of advanced theory, particularly in those streams which would allow a graduate of a technical school, either secondary or post-secondary, to go to

university if he had the interest and the aptitude. Parallel programmes and institutions would produce the teaching personnel who would train technicians in these schools for immediate employment after graduation.

The problem of creating the ideal or at least the appropriate technical teacher education institutions has yet to be fully solved even in highly industrialized countries because technical education in the schools is in the process of constant change and redefinition.

THE PREPARATION OF TECHNICAL TEACHERS IN DEVELOPING COUNTRIES

If the problem of preparing technical teachers in industrialized countries is thorny, that of preparing such teachers in developing countries is of considerably greater magnitude. In the first place, developing countries are being assisted in the development of entire systems of technical and vocational education by industrialized nations. If these nations have no clear idea of what is required for educating the future teacher of technicians, they are not in a strong position to adequately advise those countries seeking their guidance. Secondly, there is the problem of changing traditional attitudes towards education, mentioned in the introduction to this chapter. Where institutions exist in developing countries for training technicians, there is the tendency to project the evolution of these institutions into degree-granting ones on the university level. There is no doubt that such institutions are greatly needed, but if such evolution takes place at the expense of lost facilities for technical education, the sorely-needed middle-level industrial, agricultural and commercial personnel will be proportionately reduced. The direction toward solving both the problem of the education of technicians and the preparation of their teachers seems currently to lie in the creation of education complexes which provide higher technical education and teacher preparation on various levels, and include technical schools on various levels—ranging from the vocational school to the technical school of the higher level—as laboratories for the preparation of future teachers.

Institutions in Greece, Thailand, Lebanon and Singapore serve to illustrate the trends and problems of developing countries in the area of technical teacher preparation. A number of difficulties have been encountered in the creation of these institutions and programmes, and a number of problems have yet to be solved. Nevertheless on the whole considerable progress has been made.

Greece[1]

In 1967, a comprehensive project for expansion of technical teacher education facilities was initiated in Greece. A centre for virtually all levels of technical and vocational education was created—SELETE—under the Ministry of Education and Religion. It performs a number of functions serving as a general research institution, and a teacher education institution. Both a middle-level technical school and a lower school which will eventually be converted to a comprehensive school are attached to the centre.

SELETE became fully operational in 1969 and is now working almost to full capacity. The programme has been judged quite successful on the whole and it is projected that SELETE will cover more than half of the requirements for technical teaching personnel for both the private and the public schools. Therefore a majority of Greek technical and vocational teachers will be required to have achieved their qualifications in the same institution through either pre-service or in-service courses. By this means a national standard for technical teaching staff will be created. It should be noted that private schools often create special problems in developing countries. Where no system of public education existed until recently, virtually all education was the responsibility of private institutions, many of which did an excellent job of fulfilling this responsibility. On the other hand, many did and do not offer an education whose quality matches their pretences, and a number have proved to be mere profit-making institutions. Therefore some form of regulation is desirable, particularly in the area of teacher qualification, if higher national standards are to be created and maintained.

The Technical Teacher College (SELETE) offers courses to train future teachers recruited from several groups as well as upgrading courses for employed teachers. Students may, then, be university graduates, graduates of post-secondary institutions, or graduates of the middle-level vocational-technical schools, i.e., having completed twelve years of education. The courses offered range in length from six months or a year for the pedagogical preparation of vocational and technical teachers already qualified in their specialty, to a four-year integrated course for the education of higher technology teachers and a four-year integrated course for workshop teacher. In the past the centre had one large workshop attached for the further practical technical training of the future teachers, and the attached schools serve as teaching laboratories. The workshop,

1. See: Greece, Legislative Decree 789, Organization of the Technical Teacher Training School (SELETE), Athens, 31 December 1970.

however, serves not only the Technical Teachers College but is also used by the two technical schools at SELETE. It was discovered that one workshop was not sufficient: the machinery required for the teacher preparation programmes and the advanced technical school was too advanced and complex for the lower secondary school. This is but one example of the unforeseen problems which may arise in the establishment of a comprehensive institution on the model of SELETE.

At present two types of courses at SELETE for the education of technical teachers have been in operation for several years and a third, the four-year integrated course, began in 1970. One of the courses is designed to upgrade technical teachers already employed. The other, a two-year part-time course which has become a one-year full-time course, is for the further technical and pedagogical training of students with ordinary or higher technician qualification who have had experience in industry. This course is designed to broaden the general education and to advance the level of theoretical technical knowledge of the student. The thrust of the course is, however, pedagogical.

Studies of available technical personnel and projected numbers under existing arrangements clearly show that the weakest point in Greek technical education is the lack of institutions training technicians on a higher level. In order to solve this problem, the Greek government has planned five new institutions on the post-secondary level—Centres of Higher Technical Education (KATE)—partially financed by IBRD. It is proposed that staff for KATE be trained at SELETE and therefore that the facilities at SELETE expanded accordingly, particularly in the fields of mechanical, electrical and civil engineering. For university graduates, the course at SELETE will last six months; and for graduates of middle and higher technical schools, the course will last four years. In the initial phases of the programme, however, these qualifications may not always be met and therefore an in-service training scheme at SELETE will be instituted. The course will last three months and will provide pedagogical training for the newly-appointed staff of the KATE. The programme will be continued later as a means of providing refres[illegible] and upgrading in-service courses for technical teachers.

Normally those teaching in the KATE will have a university degree, have held a responsible position in industry, and will have followed the six-month course at SELETE. Although not all the KATE will offer all technical specialties, the following will be included in at least one of the KATE: engineering, food technology, agriculture, business management, health services and printing.

Where SELETE is not equipped to prepare teachers for these specialties, for example in the health services, teachers will be given their general pedagogical training at SELETE, and will develop their technical skills and the special teaching techniques particular to their fields through arrangements with other institutions, in this case local hospitals.

Despite certain problems encountered, SELETE has met with a good degree of success for several reasons. In the first place, the basic concept of SELETE was to provide a comprehensive and flexible programme for training technical and vocational teachers at all levels. Also aiding greatly its success were certain legislative measures taken by the Greek government. For example, the government has taken steps which will raise the status of technical teachers and make the teaching profession more attractive. One such measure was to raise the salary scales of technical teachers to a level higher than that of teachers in general education. A contributing factor to the success of SELETE is that, as a newly-created institution, it is not attached to one with traditions and ambitions of its own which may inhibit the development of new programmes.

Some difficulties have, however, been encountered in the course of the establishment of SELETE. In terms of workshop facilities, it was mentioned that one workshop was not adequate for the centre as it was too complex for the students in the lower school. Organization problems were encountered in the initial stages for SELETE because of the lack of national legislation. This situation was remedied in 1970 with the passage of a legislative decree defining the functions of SELETE and the legal status of its staff. One of the largest problems faced by SELETE was staffing with full-time teacher educators. In the initial stages, the staff was part-time and not permanently appointed—teaching at SELETE in addition to holding teaching positions in the technical school attached to the centre or in industry. Until SELETE was fully staffed with teacher educators whose primary concern was SELETE, the Centre could not work to full capacity.

Thailand

King Mongkut's Institute of Technology in Thailand serves as an example of how technical teacher education programmes may be attached to existing technical institutions. In 1971 this institution with three branches was established, incorporating the Thai-German Institute of Technology, the Thai-Japanese Institute of Telecommunications and the Thonburi Technical Institute. In contrast to SELETE, the institute trains one type of teacher.

The Thonburi Technical Institute was one of seven institutions in Thailand designed to prepare technicians. Since staffing these institutions was an enormous problem, the Thai government embarked upon a programme to upgrade the Thonburi Technical Institute to the degree level and to establish a teacher training programme within the institute.

The teacher training course at the institute lasts two years. For entrance into the programme, a candidate must possess a diploma in technology from either Thonburi or one of the other technical institutes. At the end of the course of studies, the successful student is awarded a Bachelor of Science (Industrial Education). The course of study is an integrated one including general and technical subjects and both theoretical and practical pedagogical courses. By far the largest proportion of the curriculum is devoted to raising the level of technical knowledge of the students.

The experience of the Thonburi Branch illustrates certain problems which may arise in curriculum planning for the education of technical teachers. In the original 1967 curriculum, a total of 67 per cent of the course was devoted to technical subjects—general, special and practical, 13 per cent to general subjects including science, and 20 per cent to pedagogical studies. Furthermore, the pedagogical studies were primarily general education courses, similar to those offered in the teachers' colleges, and had little special relevance to the specific nature of technical teaching. In 1969, the course content was revised to include some courses on the special methods of technical teaching, but the percentage of pedagogical studies in the curriculum remained the same. The special methods courses, though accepted in principle, have yet to be fully designed and implanted into the curriculum. The curriculum of the institute remains oriented more to producing technicians than technical teachers as students are directed by the Department of Specialization rather than by the pedagogical faculty. Another problem regarding the pedagogical training offered at the institute concerns practice teaching. The facilities for practice teaching are adequate, but the student-teacher is simply observed and marked: there is little provision for proper guidance before he enters the classroom situation and for discussion of his performance after. Clearly, until courses are designed according to the specific needs of future technical teachers and until students are given adequate guidance in the course of their practice teaching, the programme will not adequately prepare technical teachers.

Another problem encountered by the Thonburi branch has been the recruitment of their graduates into the teacher preparation

programme. With the upgrading of the Thonburi programme for training technicians to degree level, the graduates are even more sought after by industry. This is an obstacle to the creation of a corps of technical teachers which exists in most countries, particularly in developing ones.

The former Thai-German Institute, now a part of the Institute of Technology, offers, with assistance from the Federal Republic of Germany, various levels of teacher preparation for the vocational schools. Honour graduates from the three-year vocational schools take a two-year course for a technicians' diploma. A two-year programme of basic teacher training in mechanical and electrical specialities is also offered at this institute. After two years in this programme, students may enter one of two streams leading to a degree of B.Sc. in Industrial Education. One of the streams trains teachers of technical theory, the other, teachers of practice, i.e. workshop teachers. Furthermore, the institute offers a three-year evening course for holders of trade certificates, who, if successful, may go on to the two-year programme for shop teachers. Plans are being made to institute a programme leading to a M.Sc. in Technical Education.

Plans are also underway to institute closer lines of co-operation among teacher preparation programmes of the three branches of King Mongkut's Institute of Technology in the hope that this will strengthen the number and quality of students attracted to the teaching profession. A technical teacher preparation programme will be established at the Thai-Japanese Institute for technical teachers and closer lines of co-operation with Thonburi are especially envisaged.

The present programme at the Thonburi branch and the creation of a national institute of technology which has programmes for the training of vocational and technical teachers at various levels both serve as examples of what may be done by building on existing institutions. The cost is certainly less than the creation of a whole new complex as is the case with SELETE or as we will see is the case with IPNET in Lebanon. On the other hand, existing institutions have quite naturally certain traditions and aspirations which may be slightly at odds with the objectives of a good teacher training programme.

Lebanon

Lebanon embarked upon one of the first UNDP financed projects to provide for the education of technical teachers. The institution

which was created combines some of the characteristics of SELETE with some from the Thai project. Planning for IPNET (Institut Pedagogique National de l'Enseignement Technique) began in 1964 after the establishment of a higher technical school was well under way. Before 1960, Lebanon had no institution for the training of technicians. To meet this need the École des Arts et Métiers was created on the basis of a secondary technical school in Beirut. The upgraded school became an entirely different institution, the only technical school in Lebanon for the training of higher technicians to the *baccalauréat* level—the French *baccalauréat* level as the Lebanese school system is organized on the French model. New buildings for the school were constructed in a suburb of Beirut on a site which has now become a centre for technical education, housing in addition IPNET and a school for the hotel trades. Before the completion of the first project, it was decided that an institution for the training of technical teachers was needed, and thus IPNET was instituted on the same site, with a separate building but sharing the workshops of the École des Arts et Métiers, and there are now plans for an engineering school to be located in the same area.

IPNET performs several roles. It provides in-service courses for teachers in technical and vocational schools, and is a research centre, in addition to the two full-time courses offered for the formation of two levels of technical teacher. Entrance to IPNET is by means of a competitive examination. Candidates necessarily are graduates of the École des Arts et Métiers as they must hold the *baccalauréat.*

The courses of study vary in length. The in-service courses last from three to four months, the full-time courses from one or two years. Students may either receive a certificate of pedagogical aptitude in technical education or a *licence* in technical education, depending upon whether they take the one-year or the two-year course.

IPNET is, then, a part of a developing centre for technical studies, and will eventually provide a number of services for technical teacher education. While being an outgrowth of the École des Arts et Métiers and sharing laboratory and workshop facilities, it is nevertheless an independent institution whose purpose is pedagogical preparation. IPNET, and the centre of which it is a part, could well serve as a model for the pooling of facilities and the organization of similar centres elsewhere either by creating new institutions or by co-ordinating existing ones and establishing a pedagogical centre to serve all.

Singapore

The development of the Technical Teachers College and several of the programmes offered have been discussed in preceding chapters. These were all part-time in-service courses. One full-time programme exists for the preparation of technical teachers and plans are under way to extend and strengthen it still further. For in recent years technical streams in the sch[illegible].s have tripled and have thus produced a heavy demand for technical teachers. This full-time programme leads to a Certificate in Education (Technical).

The future teacher taking a certificate in technical education must fulfil one of three different sets of entrance requirements, each one corresponding to one of the three languages in use in Singapore: English, Chinese, Malay, and must have obtained one of the recognized school leaving certificates. Furthermore, all candidates in whatever medium must have shown in their examination proficiency in English and mathematics.

The curriculum for the course includes general subjects, pedagogical theory and teaching practice, and theoretical and practical training in a technical subject. Students may take one of three technical options: metalwork, woodwork or electricity.

Upon completion of first year, the student sits examinations in groups of subjects: pedagogy, principles and methods; general subjects; and technical subjects, theory and practice. He is also assessed on the quality of his practice teaching. At the end of the second year, the student sits the final examinations in each of the groups of subjects, which if passed, along with positive assessment of his teaching ability, lead to his qualification.

In addition to this programme, plans are underway for the institution of a three-year full-time course leading to the Bachelor of Education (Technical). This programme was designed as an extension of the existing programme leading to the Certificate in Education (Technical).

Candidates for the programme may have one of three qualifications—the Final City and Guilds of London Institute Certificate in a craft, the Industrial Technician's Certificate of the Singapore Technical Institute or Polytechnic, or a Higher School Certificate in a technical subject. The curriculum will be constructed in three streams, each one corresponding to one of the three sets of entry qualifications. For example, a student with the School Leaving Certificate will have had a more thorough background in mathematics than the student from Polytechnic. The latter will have had a better grounding than the holder of the CGLI Craft

Certificate. Therefore students in the first category take only 36 hours of mathematics, whereas students from the second category take 72, and those of the last category take 108. On the other hand, the situation is reversed for the number of hours of workshop required: the CGLI Craft Certificate holders take 186 hours of workshop practice as opposed to the 294 required of polytechnic graduates and the 330 required of those having the Higher School Leaving Certificate.

Pedagogical studies, both theoretical and practical, form the largest part of the curriculum, 55.5 per cent of the whole. It could be argued that the percentage will be even greater as 12.6 per cent of the programme will be devoted to research and development work. In this area the student is expected to do more advanced theoretical work in a pedagogical field as it relates to his special technical interest. The remainder of the programme—31.9 per cent —will be devoted to the further technical training of the student, both theoretical and practical.

Since each year the curriculum will include a mixture of all the elements, it is proposed that three levels of qualification be given, awarded on the basis of final examinations at the end of each year. Thus a student might leave after the first year with a Licentiate in Industrial Education; after the second with a Diploma or Higher Certificate in Technical Education which would roughly correspond to the present Certificate in Education (Technical) but on a slightly higher level; or he might be asked to complete the final year for the qualification of Bachelor of Education (Technical) when this course becomes available.[1]

A committee consisting of members of the Technical Department of the Teachers Training College, United Nations experts, and representatives from the Technical Education Department of the Singapore government, framed the proposal on the basis of the following general objectives: 'The objectives of a technical teacher training programme extend considerably further than providing the teacher with technical skills and the techniques for teaching them. It is equally important that he should be assisted to develop his own personality, and to structure his ideas and attitudes into a philosophy of education consistent with community aims and ideals. He should be guided in identifying his personal role as a leader and facilitated in the group learning experience of the student community for which he is responsible, rather than as an authoritarian figure concerned only with providing material for student consumption.'

1. See Appendix IV.2 for the curriculum of the proposed programme.

Perhaps the course most basic to the achievement of these objectives is that proposed on the principles of education. Because the course would be given in the first year of studies, all future vocational, technical and workshop teachers, on all three levels, would be required to take it, and thus would have a common background. The syllabus, which may be found in Appendix V.2, might serve as a guide to the formulation of similar courses for circumstances in other developing countries.

SUMMARY AND CONCLUSIONS

Eight programmes for technical teacher training have been examined in some detail. These programmes vary widely in the institutional setting, the types of curriculum offered and the type of technical teacher prepared. Certainly much more effort should be put into the development of technical teacher preparation programmes as the need is great and existing arrangements inadequate.

Technical teacher education is a major priority for developing countries and regions, for it is the category of middle-level technical personnel which is most lacking. And it is becoming ever more evident that technical personnel and skilled workers who achieve foreman level play a key role in the development of modern industry. Also, if there is a pool of native middle-level personnel, developing countries will be in a better position to attract industry to their area. Certainly international organizations should establish guiding principles for the training, salaries and status of these groups. Some steps have been taken to fill the gap, but greater efforts are needed.

Perhaps the major current question in technical teacher preparation is that of whether or not the teacher of technicians should necessarily be a trained engineer or technologist. It has been argued that this is not the case in all circumstances. The exigence of a university degree in the special technical field or the aspiration to that level has two major disadvantages. The university specialist may not be prepared to provide technicians with the theoretical training required by the nature of their future employment. Secondly, insistence on this level of specialized education considerably limits the pool from which technical teachers may be drawn. Graduate engineers and technologists are, certainly, needed for those courses in technical schools and institutes which serve as preparation for university studies or which are on a tertiary level. But for the courses designed to train either ordinary or higher

technicians for immediate employment, teachers might more appropriately have a preparation other than a specialized university degree. They could be recruited from the ranks of those with technician training and who, with suitable pedagogical training, particularly for the advanced secondary technical schools, will become effective teachers in the terminal courses. An alternative might be the Bachelor of Science level in technical education or the Bachelor of Education (Technical) with industrial experience as a technician required before assuming a teaching post.

The structure of technical teacher education programmes poses another problem. We have seen examples of integrated courses in special institutions, pedagogical courses attached to technical institutions either at the post-secondary or the university level, and centres designed to provide pedagogical preparation for technical and/or vocational teachers at various levels. There is an obvious economic advantage in the attachment of a teacher education department to an existing institution, but perhaps competition from the programmes directed to preparing students for immediate industrial employment is too great. Also, the courses offered may not be appropriate for a technical teacher, who should be able to relate theory and practice. SELETE in Greece, IPNET in Lebanon and the Technical Teachers College in Singapore train various levels of technical teacher by offering pedagogical programmes geared to the level of general education and technical qualification achieved before entry. These institutions are also concerned with furthering the technical education of their students but the emphasis is on their role as future technical teachers rather than on preparation for employment as technician or engineer. Institutions of this sort may be created from the ground up, as in the case of SELETE, or may be developed through the creation of ties between various technical institutions, as in the case of IPNET and as has been envisaged in Thailand.

In conclusion, technical teacher preparation poses an immediate as well as a long-range challenge. Programmes must be geared to immediate economic reality, as well as to long-range development goals. But most important, technical teachers will have a heavy responsibility for the general culture of their students and their personal development, as well as their technical training. Under these circumstances, programmes for technical teacher preparation must educate teachers who, in their instruction and by their example, will be truly educating technicians as men prepared to deal with our technological age and not simply train them for a specific occupation.

CHAPTER VII

ELEMENTS OF QUALITY

In the preceding chapters, numerous programmes for the initial preparation of the various categories of vocational and technical teachers have been discussed. The structure, content, and functioning of the programmes have been described for purposes of providing information and so that various means of organization may be compared. Also a number of the problems involved in the creation and smooth functioning of these programmes have been pointed out. This chapter, in contrast, will deal with some of the special elements necessary for achieving quality in vocational and technical teaching.

Having a well-functioning system of initial teacher preparation will not alone assure the quality of teaching. Programmes of initial teacher preparation must not become static and to this end they must be reviewed constantly so that improvements may be made. For teachers must not only impart skills and knowledge and motivate their students to learn: they must also educate in the broadest sense of the word. The curricula of teacher education programmes must be adapted to different or changing conditions. Teachers just beginning their career must not be led to consider that their own education is at an end, but must be encouraged to upgrade and update their knowledge constantly and to improve their teaching techniques. To achieve this, appropriate facilities must be provided. Ways must be found to provide dynamic leadership in technical and vocational education in terms of the preparation of teacher educators, administrators and supervisors. All these are problems concerning the quality of teaching and must be dealt with in developing countries whose systems of teacher education have been recently, or are in the process of being, created, and in industrialized countries as well.

In this chapter, five major areas will be discussed. These are: in-service education as it relates to continuing or lifelong education; inspection or supervisory systems to ensure the quality of teaching

and to guide teaching personnel; special problems in curriculum content and teaching methods in vocational and technical teacher education; the establishment of national and international standards; and planning for educational needs. All of these areas will be discussed with special reference to the needs of developing countries.

As has been pointed out frequently in this study, good teachers are the necessary prerequisite for excellence in vocational and technical education, as indeed in any form of education. Achieving quality in technical teaching involves any number of very complex problems. In initial teacher preparation, modern facilities and a curriculum which seems, on paper, to include all necessary courses, will be meaningless unless used properly. Thus a modern workshop or equipment is useless unless properly maintained and used to full advantage; a course listed as 'special teaching methods' in the curriculum is meaningful only when the content of the course prepares future teachers adequately for their specific tasks. Even if his initial preparation is adequate, the technical or vocational teacher must constantly be encouraged to continue his own education in both pedagogy and his special field. Good people must be encouraged to enter the field, which raises the question of technical and vocational teachers' status and remuneration. Enough teachers must be trained to meet projected demands. And these are but a few of the factors involved in achieving quality.

In the brief space available to discuss these problems, it is not possible to go into each in the necessary depth, nor to give detailed examples, nor is enough information available to do so. The object of the chapter is to point to some of the problems, and to indicate guidelines for planning in the hope of stimulating further research into their nature and solution.

IN-SERVICE TRAINING OR CONTINUING EDUCATION FOR VOCATIONAL AND TECHNICAL TEACHERS

It may justifiably be argued that in-service training is one of the most important ways of assuring quality in vocational and technical education. The statement of the Unesco/ILO Recommendation concerning this subject is very apt in this context:[1] 'The training of teachers in technical and vocational education should be considered as a process continuing throughout their career.'

1. Unesco, *Recommendation concerning Technical and Vocational Education*. Article 76.

Socrates defined true wisdom as knowledge of one's own ignorance. If a teacher considers himself once and for all prepared after his initial education, he will be a very poor teacher and example indeed. Certainly, if true for all fields of study, it is even more true for technical areas which are in a state of continual and accelerated change. Thus teacher education programmes must also prepare the future teacher to consider the knowledge and techniques he acquires there as a mere beginning, and numerous arrangements should be made so that the teacher wishes to and has the opportunity to continue his education.

In-service training may be said to have six major purposes. In the first place, in-service training may be used to upgrade employed teachers either allowing them to gain initial teacher qualification where employed on the basis of technical qualification or to complete or to raise the grade of technical qualification. Secondly, in-service courses may be used to convert mathematics and science teachers to a technical field, often a useful and economic means of meeting urgent demands. Thirdly, and this is perhaps the most widespread use of in-service courses, in-service training allows the teacher to refresh and update his knowledge in either the technical or the pedagogical fields. In the fourth place, administrators and supervisory personnel drawn from the ranks of experienced teachers may be prepared for their new tasks through in-service courses, or existing personnel may extend their knowledge of problems and methods in the administrative area. Also, through courses offered on an in-service basis, teachers may become qualified as teacher-educators. And lastly, in-service training serves the purpose of staff development.

Perhaps the major guiding principle in the development of in-service courses to fulfil any one or all of the above purposes is flexibility. It must not be forgotten that the teacher is engaged in full-time employment, and in most cases has little enough time for further study and reflection. Arrangements must then be made which alleviate the burden of normal teaching duties, thus encouraging teachers to take advantage of the facilities offered. Encouraging teachers to pursue their education is one of the most important functions of administrators and supervisors. One of the means by which this may be done is by allowing, perhaps requiring, teachers to evaluate themselves. Examples taken from the kinds of questions which could be asked follow:[1]

1. Questions taken from Colombo Plan, *Intra Regional Technician Training*, Colloquium, op. cit., p. 164–6.

Do you consider yourself fully qualified to teach the subjects assigned to you?
Do you believe that you need more education in your field of technology?
Do you believe that you need more training in how to teach your subjects?
Do you have detailed course outlines or syllabi, of all the courses you teach?
Do you follow these outlines in your teaching and do you complete all required lessons?
Do you illustrate your teaching with charts, models, demonstrations or other aids?
Do you teach both theory and practical sessions?
Attach samples of question sheets of the last terminal examination and the last semester final examinations you gave to your students.
Do you teach safety and enforce safety rules in practical sessions?
Are you punctual and regular in your own attendance at all sessions?
How many sessions have you missed during the last semester for the following reasons: casual leave, personal illness, other reasons?
List the results of the semester grades in your last three semesters of teaching.
Do you consider the results of your teaching as shown by the grades earned by your students as satisfactory?

Five major forms of in-service training have been distinguished[1] by the Council of Europe which has taken considerable interest in the continuing education of teachers. It may take the form of the short course of one to several days' duration, usually of the seminar type, which is given outside school hours either during the term or during vacation. The disadvantage of this type is that it takes away from the scarce leisure time of the teacher. A second form is the day release course, whereby the teacher is freed of his duties one day per week for up to a year's time to pursue his education and training. Either of these forms could be used for the teacher to gain valuable experience in industry. A third type is release from teaching for one term of full-time studies. Or, in the fourth place, arrangements could be made allowing the teacher to alternate teaching and training on a sandwich basis, a method often used in the United Kingdom for initial teacher qualification of teachers in Further Education

1. Council of Europe, *Extracts from Council of Europe Reports and certain U.K. Reports for use in the Course on the Training and Further Training of Teachers in Technical Schools*. Bad Hofgastein, Council of Europe, 5–10 October 1970.

Colleges engaged on the basis of their technical achievements. The fifth form is the release of the teacher for a full year so that he may change specialties, or further pursue his own. This form would conform to a type of sabbatical arrangement. There are, of course, advantages and disadvantages to be found in all these forms. One disadvantage to be found in all except the first mentioned is that a replacement for the teacher must be found which may be not only difficult in terms of finding qualified personnel, but also expensive. In the case of the day release or the sandwich type in-service course, there is a major advantage in that the teacher has the occasion to put into practice immediately what he has learned.

In addition to these forms, there are several other kinds of arrangements for in-service training.[1] Informal study circles, conferences and seminars arranged either by public authorities or teachers' associations, visits abroad, teacher exchanges either within a country or with another country are but a few examples of what may be done in this field. Correspondence courses are yet another form which is widely used. These courses have the advantage of allowing the employed teacher to pursue his studies at his own convenience. Furthermore, documentation centres which make available and distribute information in periodical form, among others, and mass communication such as television, and radio programmes directed to technical and vocational teachers may all be considered means of improving the quality of teaching through in-service education.

From the above sketch of the varieties of in-service training, it is evident that there is no one ideal form. Certainly this would neither be possible nor desirable. For in-service training should serve the widest range of needs if it is to serve to enhance the quality of vocational and technical education. Flexibility should then be the keynote in all overall plans for developing and administering in-service education. In most countries, the public authority is the ultimate educational authority. But for in-service training, the State should seek co-operation with the widest possible range of agencies: basic training authorities, universities and colleges, regional and local school authorities, scientific societies, teachers' and parents' associations, and industrial and commercial bodies. In-service training may be organized by the public authorities in collaboration with those concerned; it may also be organized by voluntary associations and through individual effort, on a national,

1. N. G. Emrich, 'Continuous Training for Teachers'. Strasbourg, 21 May 1969. Report commissioned by the Council of Europe and contained in the working papers of: Council of Europe, Course on the Training and Further Training of Teachers in Technical Schools, Bad Hofgastein, 5–10 October 1970.

regional or local basis. Public funds should be used to finance all efforts in the direction of developing in-service training.

Before discussing in more detail the various purposes of in-service training and how these purposes might be fulfilled, the question should be raised: should in-service training be voluntary or obligatory? Most concur that although in-service training should be highly encouraged by making available a variety of opportunities, and by providing incentives in terms of time off with pay, possibilities of more rapid promotion and higher pay, it should only in limited cases be compulsory. For instance, where an employed teacher has not achieved minimal teacher qualification, he should be required to do so through in-service courses. A second general recommendation which might be made concerns the frequency of in-service courses. A bare minimum to ensure standards would be a one-day or week end seminar per year, with in addition a longer course of at least one to three weeks every three to five years. Where appropriate facilities exist such minimal demands might be made on teachers.

UPGRADING AND INITIAL TEACHER QUALIFICATION

The first purpose of in-service training here distinguished is to upgrade employed teachers by either leading to initial teacher qualification or to minimum technical qualification. A considerable number of teachers are hired without initial teacher qualification, and indeed in some countries this is standard policy for certain categories of technical and vocational teacher, e.g. in Czechoslovakia (see Chapter II). In others, teacher qualification through in-service training is a perfectly acceptable 'second way', e.g. in the United Kingdom. In many countries, vocational and workshop teachers are often recruited directly from employment. They begin teaching with no pedagogical preparation. Again, as was pointed out in the chapter concerning technical teachers, often persons in this category come directly into teaching with a university degree but with no specific preparation for teaching. In these cases, a requirement that the teacher receive pedagogical training through some form of in-service course would greatly contribute to the maintenance of general standards of teacher qualification.

Recruiting vocational and workshop teachers from industry poses special problems. The candidate, usually being older and in need of job security, cannot reasonably be required to take a full-time teacher qualification course without employment. And yet though he may know his special field admirably, he will, in all likelihood, not be an effective teacher unless he pursues pedagogical

studies and has some exposure to adolescent psychology. Some form of in-service training would then be the appropriate solution, for the recruit from employment would be employed and pursue his studies concurrently.

In England, where most technical and vocational teachers are recruited from industry with no prior teacher preparation, in-service courses are the means through which many acquire initial teacher qualification. One of the more established forms of this training is the 'sandwich' system whereby the teacher intersperses terms of teaching in the Further Education Colleges with terms of pedagogical training. All four of the Colleges of Education (Technical)—Bolton, Huddersfield, Garnett and Wolverhampton—prepare teachers in this manner.

In many countries, technical teachers receive no formal pedagogical training, but are rather required to serve a probationary period before full teacher qualification. According to this method, the new teacher receives little guidance and will find it difficult to judge whether or not he is teaching in the most effective fashion. Here again in-service courses in special pedagogical techniques for technical education would be most useful, and if proper arrangements were made could indeed be required before the award of full teacher qualification.

Given the virtually universal shortage of technical and vocational teachers, often teachers may be hired who have not achieved the desirable level of trade or technician qualification. In-service courses, enabling the teacher to acquire appropriate technical qualification, should be made available in order to upgrade the teaching corps.

It should be noted again, however, that the in-service method of acquiring initial teacher qualification may not be the most appropriate for many developing countries given the limited amount of recruitment from employment possible. Nevertheless, it is highly desirable that some form of in-service training be available for teachers who entered the profession before teacher preparation programmes were developed.

CONVERSION (RETRAINING)

In-service courses may be used to prepare an employed teacher to another field. Where, for example, there is a shortage of technical teachers, mathematics and science teachers may be converted to the new field. One of the major difficulties in converting these teachers to the technical field is the provision of employment

experience. Technology and special pedagogical methods may be relatively easily taught in short courses, but for a good technical or vocational teacher, employment experience is essential. Though difficult, the obstacle need not necessarily be insurmountable for, as part of the in-service course, a period of work in industry could be made available during the summer. Less difficult is the conversion of mathematics and science teachers to the field of general technical education for though some employment experience is desirable, considerable experience is not a necessary prerequisite for this kind of teacher. France has been cited as a case where general technical teachers are recruited from the ranks of employed teachers and are trained through a series of seminars and in-service courses. Singapore serves as another example.

In-service courses for converting teachers of more traditional subjects should be highly stressed in developing countries. For this group is a very likely possible source of recruitment as technical education is more widely introduced. Through in-service courses, urgent short-term needs may rather easily and economically be met.

UPDATING

The third and most widespread use of in-service courses is for updating or refreshing the knowledge of employed teachers in either technical or pedagogical fields. Although this type of course should be voluntary, all teachers should be encouraged to constantly extend their knowledge and competence through further education.

Technical updating of teachers is an absolute necessity given the rapid pace of change in all technical areas. It could perhaps be argued that this form of in-service training is even more necessary for the teachers of technicians than for those of skilled workers, for it is in the technicians' fields that the greatest changes are occurring. Often, if the course of initial teacher preparation is rather long, the technical teacher's knowledge is outdated before he begins teaching. To prepare his students for their future jobs he must keep abreast of his field, in both the theoretical and practical aspects. In-service courses for vocational teachers are also highly desirable. For though the teacher may be a master of his craft, and able to prepare his students well, still, with the ever more sophisticated technical processes and equipment being developed, he too must keep up with the pace of change. He must prepare his students to understand more complex processes and to maintain more complex equipment than he himself was required to do.

Many programmes of technical updating must be given in close co-operation with industry, commercial establishments, etc. and with the co-operation of the teacher's employing institution. Although it may be difficult for firms to absorb extra personnel for short periods of time, governments should encourage industry and other economic sectors to make the necessary short-term sacrifice of establishing internships for teachers in the interests of a long-range good. Furthermore, school administrators should realize that in the interest of having a faculty of quality, the in-service training of teachers should be facilitated despite the inevitable expense and bother involved in finding and utilizing temporary replacements.

Technical updating courses for both technical and vocational teachers and workshop instructors may also of course be given in technical institutions or in industrial training centres, a more easily-organized solution than a co-operative programme with industry. To cite once again the experience of Singapore, various updating courses are available to all categories of technical teacher leading to higher technical qualification. These courses are given at the Teachers Training College, at the vocational institutes, at the Electro-Mechanical Training Centre, and at the Engineering Industries Development Agency, in collaboration with Singapore Polytechnic. The courses available in Singapore are an example of the flexibility which may be had by utilizing various institutions for in-service training.

Improving the teaching qualification of employed staff is a necessary concomitant to the updating of technical knowledge. With the rapid development of educational technology including new teaching aids, particularly in the audio-visual field, in programmed learning, etc., the need for pedagogical updating resembles that for technical updating. Furthermore, useful techniques such as team teaching and group dynamics are being developed and perfected. The training of teachers in the use of modern teaching aids and techniques is particularly important for developing countries. For, since teacher preparation programmes in technical fields have been instituted relatively recently, the majority of technical teachers have little if any training in special teaching methods in technical education, and are not prepared to use to full advantage new teaching aids and techniques even where these are available. In addition to preparation in new teaching methods and techniques, in-service courses in pedagogy allow teachers to consult with and learn from each other through the discussion of common educational problems. Seminars are particularly useful for this purpose, and may be organized in a variety of ways, formally or

informally, by teachers, administrators, or institutions of teacher education.

The United States has numerous programmes for pedagogical updating. Meeting of teachers' associations provide one of the major means for teachers to assemble, to find out what their colleagues are doing, to listen to lectures, and to engage in seminar discussions. The dissemination of the papers presented at such meetings and of the results of discussions are yet another means of reaching and stimulating an even greater number of teachers. Formal in-service courses in the United States are usually organized by universities and colleges. Teachers may take courses leading to university credits either in the evening or in the summer in any number of institutions. With enough course credits collected, the teacher will receive a higher degree. Indeed many states require proof of continued education in order to maintain a valid teaching certificate. Since most teachers are first employed with the B.A. degree, this requirement automatically means that the teacher must work toward the Master level, and the present tendency is to require this degree for the retention of teacher qualification. The importance of in-service training in the United States may be seen from Table 3 giving figures for the year 1970, supplied by the Department of Education.[1]

TABLE 3. Number enrolled in vocational teacher education programmes (United States)

Vocational programme	Pre-service	In-service
Agriculture	6 015	5 757
Distribution	2 951	3 804
Health	307	2 588
Home making	19 277	10 433
Home economics (gainful)	1 661	1 034
Office	12 937	8 056
Technical	*545*	*2 640*
Trades and industry	*8 667*	*20 112*
Other	158	—
	52 518	55 386

As may be seen from these figures, in the technical and trades and industry fields far more teachers are involved in some form of

1. See United States reply to questionnaire on draft.

in-service training than in initial vocational and technical teacher preparation programmes.[1]

The U.S.S.R. also places considerable emphasis on in-service training. An illustration is the system of in-service training institutes on the national and regional level, established for the further pedagogical training of teachers (compulsory at least once every five years) and for the purpose of research in the area.[2] In addition to these institutes, higher educational establishments, local vocational and technical education authorities and civic universities in large cities all offer in-service training. Teachers are also required to pursue research (planned in conjunction with the authorities of the school in which they are employed) every year.

The National In-service Training Institute for Vocational and Technical Teachers in Leningrad is the central institution for in-service training. The local branches of this institution are attached to industrial teacher training technicums. The national institute offers courses for all categories of teachers and administrative personnel in technical education. The local branches also serve all categories, but the majority of participants are workshop teachers. Participants in the courses at the national institute are chosen by both school and local vocational and technical education authorities. There is no entrance examination, simply an interview. Study groups of up to 30 are formed, the members of which are of the same professional level and specialty. The course, which lasts six months full-time or two years part-time, is a combination of technical studies both theoretical and practical, pedagogical studies and political and social sciences. Whether the emphasis is pedagogical or technical depends on the needs of the particular study group. Examinations are given at the end of the course on the syllabus covered. Attendance at a course, during which the teacher has leave with full pay, leads to professional advancement.

IN-SERVICE EDUCATION: *Sweden*

Sweden has a well-organized system of in-service education.[3] Five days per year of further education and training through in-service courses are compulsory. These days may be used for a week-long course, or may be spread out. At this time, classes are cancelled to release the teacher from his duties, but the decision as to when

1. These figures also include those working toward initial teacher qualification through in-service courses.
2. See: Elizarov, op. cit.
3. Information appended to Sweden's reply to questionnaire on draft.

classes may be cancelled lies with the local school board and so in some communities only four or fewer study days are allowed. This in-service training usually takes the form of study circles or discussion groups which work with special material carefully prepared beforehand. Outside experts may or may not be present.

A special group of consultants are responsible for the organization of these study days on a county basis and for providing appropriate materials. These consultants, who are experienced, qualified teachers, receive their basic and continued training in further training departments of the regional schools of education (which are also responsible for producing the necessary materials as well as for arranging other courses for the further education of teachers and administrators, of which a number exist). Great efforts are being made to co-ordinate further training and to plan it in accordance with the specific needs of various groups of staff.

Special measures obtain for teachers in vocational schools where opportunity is offered for them to undergo vocational practice for a certain period, usually about a month, without loss of salary and with travel and subsistence allowances. In addition, the departments of further training collaborate with various bodies in appropriate economic sectors in planning and developing in-services courses for vocational teachers.

PREPARATION AND UPDATING OF ADMINISTRATIVE AND SUPERVISORY PERSONNEL

If technical education at all levels is to function efficiently and if there is to be a constant attention given to ensuring the quality of instruction, highly competent administrators and supervisory personnel are a prime condition. Although both administrators and supervisors should be drawn from the ranks of experienced teachers, the knowledge and talents needed for performing their tasks are different. In-service courses on the post-graduate level for teachers of proven ability are an excellent way of preparing these directing *cadres*. Also, just as in-service training of various types—particularly the conference or seminar—serve to bring teachers together for discussion of common problems and mutual stimulation, so these types of courses may serve the same function for administrators and supervisors.

In addition to a thorough knowledge of the teaching profession, the administrator needs a certain breadth of vision as well as a

knowledge of handling certain technical problems of administration. He will be dealing with teachers in a number of different specialties. He has the responsibility before the educational authorities as to how his school is functioning and the quality of the curriculum and instruction. Therefore the administrator should have preparation in the organization, management and financing of educational institutions, further psychology and human relations courses, and a knowledge of what his colleagues in similar institutions are doing. The supervisor must in addition know how to evaluate teacher performance, and more important than his role as inspector or guardian, must know how to guide the people in his charge so that his task will be a positive one.

Future administrators and supervisors may be aided in their jobs by the provision of facilities for their further education and training in the specific areas of their duties. Certainly these groups may be encouraged to work for higher degrees. But perhaps most useful would be the provision of seminar series, conferences, and specific courses on vocational and technical education administration. In developing countries the award of leave and fellowships to administrators or promising young teachers to study abroad would be well worth the expense in money and in doing without the services of the person for a brief period. Certainly where there is ample opportunity in a developing country for a future teacher to receive his initial training, fellowship money might be more wisely spent in training the directing *cadres*—the administrators, supervisors and teacher educators.

An example of such a course for the preparation of administrators as well as of teachers aspiring to higher positions, and training officers in industry, may be found at three of the Colleges of Education (Technical) in the United Kingdom—Bolton, Huddersfield and Garnett. The course consists of two years' study either in part-time or sandwich form. In the sandwich form, the first and fourth terms are spent in the college. During the middle terms the teacher or administrator remains in the institution employing him and does his thesis and project work at this time, using his own classes or duties as a basis of practical application. Only those who have teacher qualification and two to five years of practical experience are eligible to enter the course. The course leads to the Diploma in Advanced Study in Technical Education or the Diploma in Further Education, the highest technical teaching awards in the United Kingdom. As will be seen below, there is another type of course available to teachers and administrators in the Further Education Colleges at the Further Education Staff College.

PREPARATION OF TEACHER EDUCATORS

One all-important subject has yet scarcely been touched. Obviously the question must be posed: who teaches future teachers and how are these teacher educators prepared? The usual answer is not a very satisfactory one: there are no special facilities for the training of the staff of teacher training institutions. Teacher educators are most often drawn from the ranks of those with higher degrees either in education or in their respective fields. In many systems appointment of a teacher educator is at the discretion of the college or university president and/or faculty. In others, teacher educators are recruited by national competition—as for the professors at ENSET in France. But in the end what is most clear is that, on the one hand, few facilities exist specifically designed for the preparation of teacher educator and on the other, there is very little information on what does exist.

Staffing teacher training institutions with qualified teacher educators and particularly the staff for the pedagogical courses is, then, a major problem for both industrialized and developing countries. For, unlike traditional academic fields, the field of teacher education requires considerable experience as a teacher—a student will not be a good teacher of pedagogy if he has gone directly from his initial university studies to an advanced degree and then directly into teacher education. The situation is complicated in technical teacher education in that the teacher educator should also have had employment experience. For the most part, developing countries must at present rely on sending future teacher educators abroad for their advanced education and utilizing foreign personnel. The problem could be alleviated with the establishment of such regional centres as that proposed for the countries participating in the Colombo Plan. In any case, promising teachers who might become teacher educators should be given leave to pursue their education.

Since experience as a teacher should be a necessary prerequisite for a competent teacher educator, preparation must be given most often in the form of in-service training. It must be admitted that this training will be of relatively long duration as the teacher educator should ideally obtain a higher degree in some field of technical education, e.g. pedagogy and psychology, educational technology, etc. on at least the Master's level and preferably the doctoral level. One way to do this would be to allow teachers short leaves or periods of release to take courses leading to the advanced degree and then to give longer leave for the necessary research and special project

work. The teacher educator must be prepared to carry out research in the field of technical and vocational teacher education with a view to the constant improvement of the quality of that preparation.

STAFF DEVELOPMENT

In-service training may also serve the purpose of staff development. Staff development may include several of the above stated purposes, e.g. updating, the training of future administrators and supervisors, but has objectives which set it apart. For one of the primary purposes of staff development is to allow for the interchange of ideas and the discussion of common problems, by teachers and administrators alike.

Staff development courses may be offered outside an institution or they may be organized by and given for the staff of one institution. This type of course is informative in nature and designed for self-development within the context of a common endeavour, whether a common area of concern or a common place of work. These courses usually take the form of relatively brief seminars or periodic meetings. Ideally, reports of the results of these courses would be printed and circulated in order to reach a wider audience. They are not designed to lead to a higher qualification, but serve rather to create a professional *esprit de corps*.

Coombe Lodge, the Further Education Staff College in the United Kingdom, offers what may be considered in-service courses for experienced teachers and for both existing and future administrators for the purpose of staff development. The college, which opened in 1963, is a residential institution which offers courses of one to three weeks' duration for the senior staff of technical colleges. The object of these short but intensive courses is to increase effectiveness in technical education, to improve its administration and to allow time for reflection and the exchange of ideas. The conferences are also designed to bring together representatives of industry, commerce, government and the universities with the higher staff of technical education. The courses, of which there are a great variety offered according to demand or a recognized need, fall into four major categories: administration and management of colleges, the interaction of technical education with industry and commerce, subject content and development, and a fourth and miscellaneous category which includes subjects such as the supply and training of technical teachers. In the specific field of administration, a few examples of the conference subjects are: the management of departments in colleges with particular reference to the provision

of ancillary services; the planning of colleges; the work of a college principal; and administration of colleges.

Usually 32 participants are accepted for any one conference. The members of the conference either meet together as a whole or in four groups of eight. Projects are studied by each of the groups which often call in an outside expert, and then the reports of the results are circulated among the whole group. These reports are then either discussed in plenary session or by another group of eight formed by two members of each of the original groups. In addition to these methods, the case study method, and visits, two others of particular interest in designing courses for administrators are used. Role-playing techniques are used to improve the administrators' methods of interviewing candidates for the staff or of dealing with existing staff. Also a method known as 'in-tray exercises' is used to teach rapid administrative problem solving. Each student is asked to make an immediate decision in an urgent problem. Each then writes his decision anonymously. The solutions are assessed by a member of the Coombe Lodge staff and are reported in a plenary session of the group and then discussed. By this method each member sees the possibilities for solution of the problem and receives guidance from the college staff and his fellow students as to what an optimum solution might be. Certainly proper decision-making as to the teaching staff, the optimum order of priorities in his school and finance is the first mark of a good administrator and such techniques in in-service courses will aid him in this crucial area.

Some form of organized staff development might prove very beneficial in the specific case of technical and vocational teacher training colleges in developing countries. Steps have been taken in this direction in Singapore and in Nigeria. Not only would such courses serve to up-date teachers but also, by setting aside a time for the discussion of common problems or for bringing in outsiders who may give fresh views of certain topics, teachers and administrators in an institution would have the occasion to see their individual concerns in a new light. This might prove particularly helpful where the whole enterprise of organizing, administering and teaching in a recently-created institution is new and relatively unfamiliar.

CONCLUSION

Adequate provision of in-service training facilities for the further education of teachers is then of utmost importance for all systems of technical and vocational teacher education if the quality of that education is to be assured. Developing countries would profit even

more by the creation of such facilities concurrently with the development of technical and vocational teacher education and from encouraging teachers to take advantage of them. In the first place, these facilities may be used to convert teachers from often preferred academic streams to the technical and vocational ones. Furthermore, through in-service courses, teachers in all technical and vocational areas could be upgraded, particularly as new institutions are created which older teachers would not have the opportunity of attending unless special provision be made. Yet another problem to which a solution could be found through in-service courses is that of staffing the teacher training establishments. As was seen in the case of SELETE before appropriate legislation was instituted and as can be said to be true for most of the new teacher preparation institutions, the lack of competent teacher educators has proved a stumbling block to the rapid development of technical teacher education and hence to technical education as a whole.

In conclusion, a wide range of in-service courses do and should exist. Where little or no such facilities exist, their future creation should be incorporated into a national plan for educational development. These courses should be geared to providing maximum opportunity and maximum quality in the technical teaching profession. Furthermore, flexibility in the organization of such courses should be the keynote in order that these goals be achieved. But it must also be kept in mind that the conditions must be created whereby teachers will be encouraged to take full advantage of what is offered and pursue such further education throughout their careers.

INSPECTION OR SUPERVISORY SYSTEMS

Any system of vocational and technical education requires some form of inspection or supervision to ensure that the quality of teaching is as high as possible, and that it conforms to national standards. Provision for some type of supervision should then be an integral part of planning in vocational and technical education, as evidenced by the ILO Recommendation on the subject:[1] 'The teaching staff of training institutions should be regularly inspected or supervised by the competent authorities with a view to assisting them in their work and improving the instruction given.'

The supervisor or inspector performs a number of duties. He must ensure that teachers and administrators are performing their

1. ILO, *Recommendation concerning Vocational Training.*

functions properly. But his most important function is one of guidance: he should be much more than simply an educational watchdog. In the first place the rights of the teacher against arbitrary evaluation must be protected and in the second place, the supervisor should perform a positive function. As an experienced outside observer he is well placed to pinpoint weaknesses and to make recommendations as to how the situation may be changed for the better, or he will recognize certain strengths which may then be the basis of recommendation for other teachers or other schools. The Unesco Recommendation concerning the Status of Teachers defines the role of the supervisor and the rights of the teacher in the following paragraphs:[1]

'Any system of inspection or supervision should be designed to encourage and help teachers in the performance of their professional tasks and should be such as not to diminish the freedom, initiative and responsibility of teachers.

'(i) Where any kind of direct assessment of the teacher's work is required, such assessment should be objective and should be made known to the teacher.

'(ii) Teachers should have the right to appeal against assessments which they deem to be unjustified.'

Because the supervisor is usually a public official, either national or local, he is in a position to encourage the maintenance of uniform standards, and also to make recommendations concerning the delegation of public funds for change and improvement. The supervisor or inspector, then, performs a dual role: that of both guidance and inspection. He should be equipped to make constructive recommendations and at the same time have the authority to impose accepted standards.

The general qualifications for the supervisor of technical and vocational education are numerous. He, as in the case of the teacher educator, should have a superior education, on the Master's or doctoral level, in some area of technical or vocational education. He should have had considerable teaching experience so that he is aware of the problems faced by technical and vocational teachers. In addition, ideally, he will have had some administrative experience, so that he will be aware of the obstacles encountered by administrators and what feasible actions may be taken. Because one person cannot be expected to be competent in all fields nor to have all necessary qualifications, a system of collective evaluation using teams of supervisors might be worthy of consideration.

1. Unesco, *Recommendation concerning the Status of Teachers*, VIII, 63 and 64.

The supervisor may perform his functions in a variety of ways. Always, however, he should try to create an atmosphere in which teachers and administrators consider that he is working with them, not against them. One of the most obvious methods of supervision is the observation of classroom teaching. He could make out a report similar to that shown in Figure 6. Immediately after the class or in the course of the day he could discuss his evaluation with the teacher, taking the teacher's response into consideration in his final report. Supervisors, as mentioned earlier, are also in a very good position to recommend in-service training where it is obviously needed or where it would improve even further a teacher's ability. Also positive evaluation should be the basis for promotion.

In addition to his supervision of individual teachers, the supervisor could have conferences with representatives of the teaching staff and administration so that general problems and policies may be discussed and ideas exchanged. Furthermore, the supervisor should see that as far as possible the school retains records of its graduates' careers, including information provided by both the employer and the former student, so that the preparation given in a particular school may be better assessed and changed in accordance with changing needs. Again, the need for maintaining a close relationship between the technical and vocational education authorities and industry is illustrated.

A supervisory system is, then, most necessary in order to assure quality in vocational and technical education. It has, however, some delicate aspects, and so must be instituted with care and in addition, very competent people must be recruited if the system is to function smoothly and effectively and to contribute to higher quality.

CURRICULUM CONTENT OF TEACHER EDUCATION PROGRAMMES

In previous chapters some sample curricula and course syllabi have been given as illustration of the content of various vocational and technical teacher education programmes. In this section, we shall look more closely at certain vital aspects of any such teacher preparation. The central problem is how the future vocational or technical teacher may be better equipped to educate and guide students, on the one hand, and on the other how he may elicit motivation to learn on the part of the students. The path to the solution of this problem lies in the direction of special pedagogical training, as well

SUPERVISOR'S REPORT

Name ..... Date .....

Subject ..... School .....

1. *Teaching qualities*	No basis to judge	Excellent	Very good	Good	Fair	Poor	Remarks
Scholarship—general							
Effectiveness in teaching							
Effectiveness in written expression							
Command of subject taught							
Planning for instruction							
Classroom climate							
Use of new teaching methods							
Use of new educational devices							
Professional attitude							
Ability to supervise							
Ability to organize							
Ability to administer							

2. *General characteristics:* Ability to work with people
Initiative
Enthusiasm and willingness to work
Friendliness
Personality
Appearance, poise and manner
Judgement
Reliability and responsibility
Leadership qualities

SIGNED: Supervisor ..... Principal ..... Teacher .....

Type of further training suggested: .....

Contested yes/no: Give reason:

FIG. 6

as work experience similar to that in which students will be engaged after completing a course of instruction. In these two areas, developing countries face special problems, and special solutions must be found.

SPECIAL TEACHING METHODS

It is patently evident that technical and vocational education, even more so than traditional academic fields, can not rely on old and now outdated teaching methods. This is true for not only the schools but for the teacher training institutions as well. That is, teacher preparation programmes must set an example in their use of modern methods, for it is according to this example that future teachers will themselves teach. In the past, the authoritarianism of the lecture system prevailed. For the most part this method is no longer deemed valid and should not then be the prime means of instruction on the higher level of teacher education. Where lectures are given to large groups by an expert, these should be followed up by seminar and tutorial work. Current education theory holds that students should be led to make discoveries on their own and to feel active participants rather than passive recipients in the educational process. This principle should be particularly upheld in technical and vocational education for several reasons. In the first place, to be competent in a trade or a technical area, one must have practical skills and an ability to put theory into practice which is developed only through doing. Secondly, only if the student has been led to a sense of discovery through his own work and only if he has been given considerable responsibility will he be equipped to adapt later to changes in his field. The same is true for the teacher who must be prepared to learn on his own and to take advantage of further education throughout his career. As Horace Mann, a well-known American educator once said: 'The teacher who is attempting to teach without inspiring the pupils with a desire to learn is hammering on cold iron'.

How may the teacher be prepared to perform this role of leading students to discover knowledge? There is no patented answer but a good beginning may be in teacher education programmes, which should not be authoritarian in nature. Lectures may be valid, particularly where few or no text books exist, but they should serve only to give basic information or to introduce new concepts. The thrust of technical teacher education should be seminar work, tutorials, project work by small groups and individuals. Not only should the methods of the programme serve as an example, but also

the content (particularly of the special pedagogy courses) should emphasize the variety of methods available to the technical and vocational teacher and their value.

The central course in any vocational or technical teacher preparation programme should be the course or courses in special pedagogy. It is here that the dual lines of the programmes—the technical and the pedagogical—are tied together. It is in these courses, in conjunction with practice teaching, that the future teacher learns to communicate his technical knowledge and skills most effectively, for few people are endowed with natural teaching gifts. General pedagogical and psychology courses are of great value as a foundation,[1] but the student must learn the special methods of teaching in a technical or a trade and industrial field, and the psychology applicable to students in vocational or technical education, or his teacher preparation will be incomplete.

What then should the content of special methods courses include? A special psychology course must prepare teachers for the kind of student he will be dealing with, what this student's interests and problems are likely to be, and how he may be most effectively taught.[2] For example the teacher of a 16-year-old, employed in industry and taking a day release vocational programme, and therefore with an adult's position in terms of work life but with the emotional reactions of an adolescent, must have had training in adolescent psychology with special reference to the working adolescent, and industrial psychology and organization. The teacher of theory in courses for future skilled workers and technicians must know how to relate theory closely to practice, indeed showing first how a physical principle works and then explaining why, so that learning is derived from direct experience. The future teacher must learn how to organize his course, and to organize each lesson in such a fashion that the material will be covered but that there is enough flexibility to allow for the needs of particular students.

Special methods courses may be designed in a variety of ways. Depending on the length of the teacher preparation programme, they may be broad in nature, dealing for example with special psychology, methods of course organization, the use of teaching aids, etc.[3] Or, if time permits, these topics may be dealt with in separate and more specialized courses. The course in vocational-technical teaching methods at the Men's Technical Teacher Training College in Turkey, serves as an example of a specialized course.

1. For a sample syllabus, see Appendix V.2.
2. For a sample syllabus, see Appendix V.5.
3. See Appendix V.3 and 4 for sample syllabi.

It is one of nine required professional courses, the others being: foundations of education; instructional analysis; course development; testing and evaluation; instructional materials; shop and laboratory management; teacher vocational guidance; and practice teaching. The methods course is designed as a prelude to practice teaching. Students learn how to prepare a variety of lessons, skill demonstration, discussion lessons, and information lectures. Students must prepare and give to the class sample lessons of each type in their own technical or vocational field. Along with this instruction, students are taught evaluation procedures, must plan and co-ordinate instructional materials for various types of lessons, and to appreciate the value of the well-planned and presented lesson for effectiveness, efficiency and creativity in teaching.

In the teaching of these special courses, teacher educators should explore modern teaching techniques.

Micro-teaching serves as a good example of the use of advances in educational technology and teaching techniques in teacher training. According to this method, a student-teacher (or a teacher taking an in-service course), prepares and presents a very brief lesson of from 5 to 20 minutes in length to a small group of students. The presentation is recorded on video tape. The student teacher, by watching himself on the tape, may make a self-evaluation of his weaknesses and strengths, and may obtain comments, criticisms and suggestions from his colleagues and his instructors. The micro-teaching method, though no substitute for practice teaching, would nevertheless serve as a very useful method in teacher education programmes. This method could also be used to test the effectiveness of new curriculum materials and teaching aids before they are introduced into the classroom on a large scale.

PRACTICE TEACHING

The culmination of a technical teacher preparation programme should be the practical teaching experience under the close supervision and guidance of an experienced teacher and a teacher-educator. It is at this time that the student has the opportunity to test what he has learned in the classroom, shop and laboratory in a real situation. Indeed no teacher preparation programme should be considered complete without provision for practice teaching, for students must be given the opportunity to gain self-confidence, to determine how they are most effective as individual teachers, and to do so in tandem with experienced people. In this way, faults in lesson organization and in presentation may be corrected before the

student assumes full responsibility in a teaching post. The practice teaching phase will not serve its purpose unless the student is personally evaluated and given all necessary guidance.

In order to implement the course in practice teaching, teacher preparation institutions must maintain the closest ties with the schools and education authorities. Various arrangements may be made. Some institutions have schools attached to them as we have seen in a number of cases, SELETE in Greece and the Central Training Institutes in India, for example. The most common arrangement is to work in collaboration with several nearby schools.

Whatever the difficulties in organizing practice teaching for a number of student teachers, every effort must be made to overcome them. For, quality in instruction depends upon the effectiveness of the teaching techniques of the individual teacher. The student acquires these techniques, which are a matter of effective use of the methods he has learned and the aids he employs, in his practice teaching. The quality of his techniques even in the future will be greatly influenced by his initial supervised teaching experience.

A future teacher's grasp of his technical field is then not sufficient to assure that he will be a good technical or vocational teacher. He must know how to communicate in an effective manner orally, in writing, and, very important, graphically, his knowledge and skills and to educate in the largest sense. It is in the quality of the special methods courses culminating in the practical teaching experience which will determine whether or not a teacher preparation programme will be successful and lead to progress in technical education.

PRACTICAL EXPERIENCE IN EMPLOYMENT

If the special methods courses are themselves to succeed, however, they must be based on the thorough preparation of future teachers in their respective fields. The theoretical knowledge necessary to any given technical or vocational field is relatively easily imparted. What will determine the quality of the technical education of future teachers is, however, the extent of practical experience in the field which any given student acquires. The provision of periods of work in industry, agriculture, commerce, etc. for student teachers poses perhaps one of the most difficult problems of organization in technical and vocational teacher preparation programmes, especially in developing countries. If quality is to be achieved, means must be

found to provide this experience, either in a 'real' situation or in simulated form.

Employment experience in the special field is a problem wherever there is an integrated initial teacher preparation programme. Obviously there is no problem in those industrialized countries where a number of vocational and technical teachers are recruited from industry or other sectors. However, where industry is in the initial stages of development, it is highly unlikely that this will be a source of recruitment of teachers and there will be little room for temporary student employment. Even in industrialized countries, co-operation between industry and teacher training institutions is difficult to organize. But given the fact that employment experience is a vital component in the preparation of technical and vocational teachers, education authorities, individual institutions and the various economic sectors must find the means to work together as closely as possible through such means as internship programmes.

There are, then, two ways in which a student teacher may gain experience in his field: either by working in a firm or enterprise or by working in similar conditions provided by a factory attached to the teacher training institution. In the following paragraphs examples of each type in relation to industry will be discussed.

In 1967, Rutgers University, the State University of New Jersey (United States), instituted, with the help of the Ford Foundation, a work study programme for the preparation of vocational teachers. It takes six years on the average to complete and leads to the Bachelor of Education degree and teacher certification. The programme has two major advantages: students who might otherwise not pursue tertiary studies for financial reasons are able to earn a living while working toward the degree and the graduate of the programme has had a thorough practical experience in his field. The programme is carried out with the aid of an advisory committee which includes representatives of the State Vocational Education authorities, industry, teacher educators and practising vocational teachers. The school assures the full-time employment of the student. Courses leading toward the degree are given in the evening. Although no course credit is given for the work experience which is supervised by teacher educators, a student, if he feels that he is qualified, may register for the skill competency examination given by the state after he has completed at least 5,000 hours of employment. Upon successful completion of this examination which gives him full trade qualification, the student is awarded 12 hours of

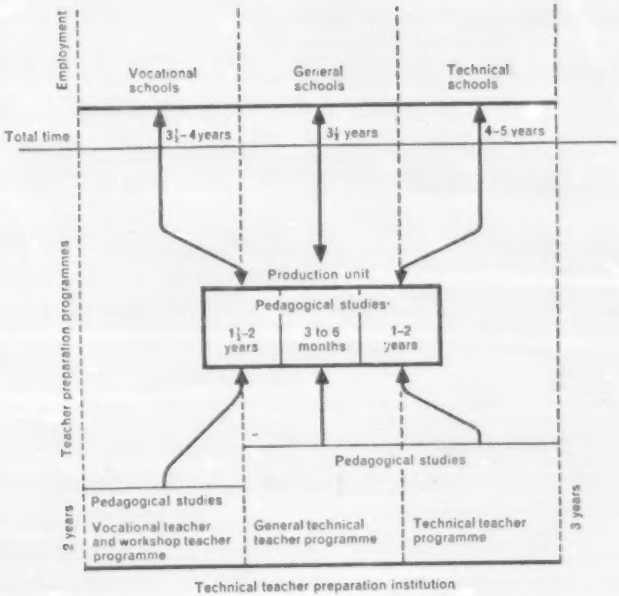


FIG. 7. Organization chart for technical teacher preparation programmes in institutions and production units. *Note:* According to this scheme teachers would return periodically to the Production Unit as part of their continued education to design and produce teaching aids and materials and to assist preparing student teachers.

credit towards the total number of credit hours necessary for his degree.

Where such co-operation with industry is impossible because of lack of industry or its inability to take on students for training, another means must be found. One solution to the problem, and one to be highly recommended for developing countries, is the creation of producing factories, called production units, attached to the teacher preparation institutions.[1] The production units would enable students to work under real factory conditions, and would serve as workshops for the technical courses in the programme. These units could be designed to produce materials for the workshops of the primary or lower secondary schools as well as for the vocational and technical schools. Furthermore, prototype educational equipment could be produced. This type of arrangement, already well worked out in the U.S.S.R., has a number of advantages. The future teacher will both achieve further technical competence and be aware of working conditions in a producing factory which differ from those in a school workshop. As a source of equipment for the schools such units would be economic. They can be designed to meet specific pedagogical needs, which cannot be met in a situation where the pedagogical function is subordinated to production. For example, the staff might be 50 per cent professional in a technical field and 50 per cent specialists in teacher education. A student could be required to spend six months or more in the production unit learning both technical and management skills after completion of his course of teacher preparation before taking up a teaching post. These units could be designed to meet the training needs of several categories of vocational and technical teachers. Figure 7 shows the organization of a model education and training programme for all categories of technical and vocational teacher in an institution with an attached production unit. A layout for such a production unit may be seen in Figure 8.

The creation of such units would, then, be a relatively cheap and certainly efficient way of ensuring that technical and vocational teachers have the necessary practical experience in their field for them to be effective teachers of future workers and technicians. Furthermore, these units would specifically serve the education system as a whole.

1. See Unesco, 'Production Units and Technical Teacher Education', EDSTE/2769/91171, a working paper prepared in 1971 by the Secretariat for use in several international seminars, including, 'Seminar on Elementary Technology as a Component of General Secondary Education in Africa', Nairobi, Kenya, 15–25 November 1971.

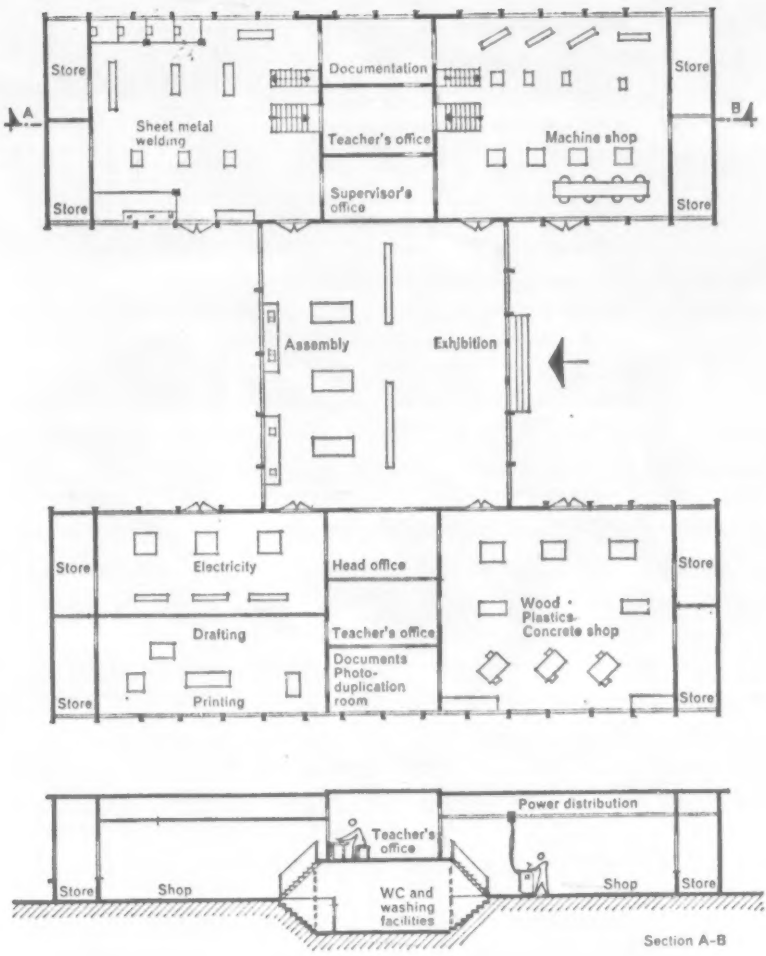


FIG. 8. Production unit.

TEACHING AIDS AND MATERIALS

Another element of technical and vocational teacher preparation to which a great deal of attention should be given is training in the use and production of teaching aids and therefore in the ability to utilize products of ever-increasing educational technology. Future teachers should be familiar with the rapid advances made in this field and should be prepared to utilize the new aids and methods to full advantage. Two reasons serve to justify this training. With more and more children staying longer in schools, new aids such as closed-circuit television and methods such as programmed instruction may help solve the teacher shortage.[1] Secondly, the new aids are designed to make teaching more effective and hence to lead to progress in education. It is the job of the teacher preparation institutions to take the lead by introducing these methods and aids into the student teachers' special subjects courses, as was suggested in the discussion of micro-teaching, as well as train them in their use.

A good teacher preparation programme should include considerable training in the use and possibilities of audio-visual aids. These courses should lead the future teacher to be aware of the possibilities in the rapidly expanding field of educational technology. He must be able to choose from the aids available to him those which will be most effective in his field. He should be prepared, at the end of his training, to adapt those aids creatively to his own subject and ideally be prepared to make innovations in creating his own teaching aids.

Preparing future technical and vocational teachers to create and use teaching aids and materials, from the simplest to the most complex, is nowhere more important than in developing countries. For, in the first place, often the most fundamental materials of technical teaching—workbooks, simple audio-visual aids—are not available. The teacher must know how to create these himself. The problem is compounded by the fact that often the future teacher receives his preparation in an international language, but must teach in a local language. In this case he should have specific training in the preparation of teaching materials in the language in which he is to teach.

One possible way to tackle this dual problem of lack of teaching materials and the language barrier is to introduce printing and

1. On programmed instruction, see: J. Pocztar, *The Theory and Practice of Programmed Instruction* (this series, VII), Paris, Unesco, 1972; and Unesco, 'Programmed Instruction for Technical and Vocational Education, a Guide', ED/WS/290, Paris, Unesco, 25 February 1972, 59 p., based on pilot programmes at IPNET in Lebanon.

photographic units into the workshop facilities, or better still into the production units of teacher education institutions. Future teachers could then be taught not only how to use the various types of duplicating or printing machinery—but could also be responsible for designing and writing the materials to be printed. This might be a part of a course on teaching aids. For example, each student teacher might be responsible for drawing up a lesson plan and a co-ordinated student worksheet. The worksheet would include drawings, questions and directions to the student for completion of the sheet. The written materials, kept to a minimum, should be in the local language. The student teacher would then use some printing medium to reproduce his work. Such a project would serve a number of purposes. The student would know how to prepare originals for printing; he would have created his own teaching materials; and he would have done so in the language in which he is to teach. A programme along these lines has been instituted in Singapore under the name 'scheme production'.

The printing unit in the teacher education institution could also serve a larger purpose. It could be the basis of research and curriculum development for technical and vocational education in that teacher educators, in conjunction with international experts in the initial stages, could create and publish inexpensively teaching materials in local languages. An example of the possibilities of offset printing for books in Dari may be found in Figures 9 and 10 overleaf. It should be noted that the written material is indeed kept to a minimum and maximum use is made of graphics. Also in this context, a number of difficulties arise revolving around copyrights. If material previously printed is used, permission from the author and publisher must be obtained. If a lot of time is spent making original drawings and diagrams readily available elsewhere, much time and effort are wasted. A solution must be found to this problem—perhaps involving standard materials (e.g., diagrams, technical illustrations) published by an international or regional organization which may be easily adapted to various languages and uses.

The preceding discussion illustrates but a small part of the complex language problem which acts as a barrier to the growth of technical and vocational education in developing countries. There are three major areas of consideration in the establishment of language policy. Every effort should be made to develop local languages. This, however, poses special problems for technical and vocational education since technical terms and concepts are difficult to adapt to a number of languages. Secondly, attention should be given to the learning of an international language as a second

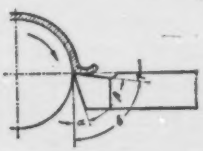
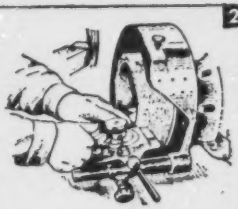
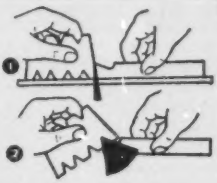
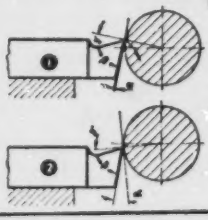
WORKSHOP TECHNOLOGY	METAL CUTTING
1 	Define the names of tool angles: α - END RELIEF ANGLE β - LIP ANGLE γ - BACK RAKE ANGLE δ - CUTTING ANGLE
2 	How is a single point lathe tool sharpened? THE TOOL IS PLACED ON A TABLE ADJUSTED TO THE ANGLE TO BE GROUND. A CUP-WHEEL IS BEST USED AS A GRINDING WHEEL.
3 	Explain the checking of the lathe tool angles: THE TOOL ANGLES ARE CHECKED WITH A GAUGE. PLACE THE TOOL ON A FLAT SURFACE THEN: 1 – CONTROL RELIEF ANGLE 2 – CHECK LIP ANGLE
4 	Explain the effect of tool setting: 1 – TOOL ABOVE CENTRE REDUCES RELIEF ANGLE (α) AND INCREASES THE RAKE (γ) 2 – TOOL BELOW CENTRE REDUCES THE RAKE ANGLE AND INCREASES THE RELIEF ANGLE

FIG. 9

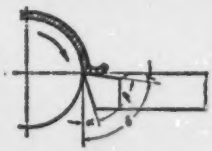
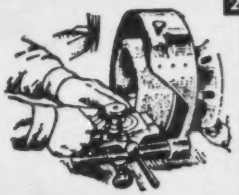
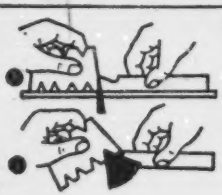
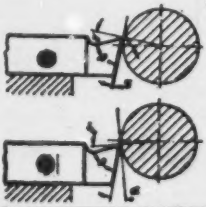
WORKSHOP TECHNOLOGY	page 26 پل های خراطی
1 	۱- زوایای پل خراطی را تشریح دهید؟
2 	۲- برای ساختن پل های خراطی از کدام مواد استفاده میکنند؟
3 	۳- روشهای بستن کردن پل های خراطی نوشته و آن چطور خورد تنظیم میشود؟
4 	۴- چطور نوارهای یک پل خراطی تعویض میشود؟

FIG. 10

language—where this may be feasibly required—and how best to teach the language. Thirdly, the problems involved where an international language is the only medium of instruction should be studied more carefully.

Many technical and vocational teacher education programmes now in progress in developing areas serve to illustrate the particular difficulties encountered where an international language is the only medium of instruction. If the student teacher does not have an adequate command of the international language, obviously his preparation will be much weakened. Furthermore, at present it is a virtual necessity that technical and vocational teachers be proficient in an international language if they are to keep up with new developments in their fields, for research results and information concerning new techniques are usually published in one of these languages. But perhaps most difficult for the student teacher having received his preparation in a language other than his native one is the problem of teaching in a different language from that in which he has learned.

The problems of language for technical and vocational teacher education in developing countries are then enormous. This is a fundamental problem to whose solution more time and effort should be given. One possibility has been indicated above as a step towards alleviation of the problem: giving future teachers training in preparing materials in their native language. The ability to teach in the native language is perhaps most important for teachers in general technical courses and in courses for skilled workers in order that this basic vocational and technical education be available to as many as possible. The establishment of a sound language policy and the introduction in teacher education programmes of courses dealing with the preparation of materials and teaching aids in the native language are then prerequisites for the progress of vocational and technical education in developing countries. This is indeed a vital area of research and one necessitating initiative on the part of individual countries and international and regional organizations.

RESEARCH AND INFORMATION FACILITIES

If viable educational reforms are to be undertaken, they must be based on rigorous research in the field affected. In many areas of education, large amounts of valuable research have been done or are in process. This is not, however, the case for teacher education

which virtually everywhere remains a relatively undeveloped research area.[1] Even fewer facilities exist specifically for research in the area of technical and vocational teacher education. Furthermore, if research in this, as any, area is to make an impact, rationally organized information facilities are a necessity. Continual research, the encouragement of teachers and teacher-educators to engage in research, and the distribution of information is certainly one of the primary elements if quality is to be achieved and maintained in technical and vocational teacher education.

Unesco has made specific recommendations concerning the role of research and its importance for all aspects of technical and vocational education:[2]

'The spirit of research should be fostered at all levels of technical and vocational education. The responsible authorities should encourage:

'(a) scientific and technological research at higher technical institutions;

'(b) research applied to the appraisal and orientation of sound curricula in technical and vocational education for a country or region;

'(c) pedagogic research applied to technical and vocational education, its methods, means of action and use of equipment.'

Developing countries are particularly affected by lack of good research and information facilities. The problems faced in the development of technical and vocational teacher education are different in each country and in each region. The conditions in which this education is to be implanted are new. Thus in developing their systems and programmes for technical and vocational teacher education, developing countries should consider, from the beginning, the establishment of research and information facilities, which even though on a modest scale at first, may be expanded concurrently with expansion in the system of technical and vocational education and teacher training as a whole.

The creation of national centres for research and information concerning technical and vocational education and teacher training may be posed as a relatively long-range goal. A number of industrialized countries. e.g. France and the U.S.S.R., have such national facilities which also publish the results of their research. In other such countries there are a number of different types of centre, public or private, independent or attached to educational institutions which

1. A. Yates, ed., *Current Problems of Teacher Education*, report of a meeting of International Experts Hamburg, Unesco Institute for Education, 1967, p. 68–76.
2. Unesco, *Recommendation concerning Technical and Vocational Education*. Article 92.

carry out such work and make available the results. In developing countries, such institutes or centres devoted to research in technical and vocational education associated with ministries of education and other interested parties could serve a very useful teacher training function in establishing national standards, advising the government on policy making, and providing continuous research for the creation and improvement of teacher training facilities. Among its responsibilities might be the provision of a national documentation and information centre where teachers and teacher educators could easily obtain information on new teaching methods and curriculum developed in various countries, as well as material (e.g. films, tapes) which could be used in courses. The directing board might include educators and members of government and industry so that the teacher preparation system as well as that of technical and vocational education as a whole could be more easily adapted to and co-ordinated with economic and development needs. Centres of this type established on a regional level engaging for example in comparative studies would aid those countries whose educational problems are similar, enabling them to pool scarce resources to avoid unnecessary duplication of effort.

A beginning toward achieving these fairly long-range objectives may be made in the fledgling technical and vocational teacher preparation institution. A research and documentation centre should be attached to all institutions concerned with technical and vocational teacher preparation. But where there is only one such institution of national stature, this department may become the foundation for a larger centre.

The components of such a centre might be several:[1] a documentation centre, an information service, and a section actively concerned with publications and promoting co-operation with other schools and institutes. The centre would then serve several purposes. The documentation would be at the disposal of the students and staff of the institution. The staff, or teacher-educators, would then have material at hand to pursue their own research which should be an integral part of their duties. The aspiring teachers, through the guided use of these facilities, would learn research methods and would become aware of the value of keeping up with current pedagogical and technical research. Furthermore,

1. D. Petry, 'Documentation Centre and Information Service', paper presented to the Unesco Seminar for Experts and Counterpart Staff on Technical Teacher Education, International Centre for Advanced Technical and Vocational Training, Turin, Italy, 6–18 September 1971 (included in appendices to final report).

the technical teacher preparation institution should be a place to which teachers return throughout their career either for formal in-service courses or simply to further their own individual work. The documentation centre component should be more than simply a library, but should also store and collect all types of materials, e.g. films, teaching aids, tapes and particularly the research done in the institution. The information service would take an active role in making all documentation available to users and in informing prospective users of the possibilities offered by the centre. Another department would be responsible for publications of newsletters, or a magazine and also for promoting co-operation with other schools and centres, and for organizing seminars in the centre and outside.

PHYSICAL FACILITIES

Mention, although brief, should be made of the importance of proper physical facilities for teacher preparation institutions. A functional as well as pleasant working environment may contribute a great deal to learning. Thus considerable thought should go into the planning and construction of physical facilities in order to create the appropriate environment.

Among the important elements of these facilities, might be listed:

lecture rooms with good lighting and accoustics;
classrooms designed for the particular function they will serve;
small rooms for study groups and seminar work;
space for individual work, e.g. study cubicle, best placed in library;
well-organized library facilities conducive to individual research work and study;
conference rooms;
staff rooms;
good boarding facilities, particularly important for national institutions;
and of course, well-planned and equipped workshop facilities.

The creation of appropriate physical facilities is not just a matter of providing the necessary funds and materials. They should be planned and designed by experienced specialized architects in conjunction with teacher educators in order to best serve the education process.

NATIONAL AND INTERNATIONAL STANDARDS

The establishment of and adherence to national and international standards are a necessity if quality in vocational and technical

education is to be achieved and maintained. International recommendations such as the Unesco Recommendation concerning the Status of Teachers, the Unesco Recommendation concerning Technical and Vocational Education, the ILO Recommendation concerning Vocational Training establish certain guidelines. If they are followed not only will standards be higher but also international exchange will be facilitated. It is the role of the individual countries to set their own standards and provide the means of ensuring that they are upheld. This may for example be done under a system of national examinations. The establishment of standards concerning the certification of vocational and technical teachers, their status and their working conditions and salary is a major prerequisite if competent people to be drawn into and remain in the profession and if a sense of accomplishment and professional pride is to be developed.

It is now virtually universal practice that vocational and technical teachers of all categories are required to have had a post-secondary education. But, as we have seen in the course of this study, the programmes vary widely as to length and the nature of certification awarded on completion. The present trend, which is to be encouraged, is to require at least a first university degree level education for teaching in secondary schools. Although this may not be an absolute necessity in the case of workshop teachers, certainly continued education should be encouraged. In establishing standards of teacher certification, not only should the level of studies be considered but the content as well. All teachers should be required not only to have demonstrated knowledge in their field, but should also have had pedagogical training as well, before achieving full teacher certification. Furthermore, related employment experience should be seriously considered and appropriate credit in terms of salary and seniority given. Standards for vocational and technical teachers, full-time as weli as part-time, should be comparable to, if not higher than, those for teachers of general subjects. If not, the group will lack professional pride and will not induce competent people to join its ranks.

The standards for teacher certification are, then, very closely connected to the status of the vocational and technical teacher. These teachers should have the same status as any other teacher of their qualification and experience. If the entire teaching corps is to work together for the progress of education in the interest of the students and the society, no one group may be discriminated against.

Certainly one of the indications in the past of the lower status of

the vocational and technical teacher, has been the lower salaries received. This must be changed if quality in technical and vocational education is to be achieved. It is particularly important in this case as salaries in industry and commerce are much more attractive than those in education under the best conditions. If an even lower salary than is normal for other teachers is offered to those who may find employment in industry or the other sectors, few will be tempted by the teaching profession. In addition, technical or vocational teachers, like all other teachers, are entitled to proper working conditions, including teaching loads light enough to allow for thorough lesson preparation, and leave which allows them to update their knowledge. Thus implementation of material standards through certification procedures and legislation should be an important part of educational planning.

SUMMARY AND CONCLUSIONS

This chapter has given but the briefest of sketches of some of the elements, which in addition to structures, institutions and curricula should be considered in planning and executing if quality in vocational and technical teacher education is to be achieved. Certainly, the problems are numerous and complex. Solutions, and good ones at that, are nevertheless possible, as has been suggested. They involve the co-operation of the education authorities, industry and other sectors of the economy, teacher preparation institutions of all sorts, teachers' associations, government authorities and international organizations.

Much progress has been made in all areas of vocational and technical teacher preparation. Further or permanent education is becoming widely recognized as not only desirable but also necessary and in-service courses serving a wide range of needs have been established in many countries. Much work is being done in the area of curriculum development, and vocational and technical teachers are rapidly achieving equal status as the programmes for their preparation are instituted at the same level as for other teachers. Yet much remains to be done.

Many developing countries have only recently instituted programmes of technical and vocational teacher preparation. Whereas these programmes of initial preparation are often proving to be of high quality, nevertheless this is only the beginning step in the creation of a teaching corps of high competence and professional pride.

CHAPTER VIII

CONCLUSION

Technical and vocational teacher preparation should be first on the list of priorities if technical education on all levels is to be developed and expanded. Vocational and technical teachers occupy a key position in the modern world. It is they who form the link between the educational system and the world of industry, agriculture, business and other occupational areas. And it is they who will be responsible for the education and training of the increasing numbers of skilled workers and technicians needed for economic and technical progress. The preparation of these teachers poses, then, a great challenge to both industrialized and developing countries.

One of the major themes of this study has been the proposition that any kind of education will only be as good as its teachers. The particular forms of teacher preparation may vary widely, according to the societies which these teachers are to serve. No matter what the means of preparing technical and vocational teachers, however, the major goal should be the formation of a corps of dedicated and well-educated teachers. Teachers will then be capable of educating as well as training future skilled workers and technicians, preparing them for their roles in a world characterized by rapidly changing technology.

This study has dealt primarily with two major areas in vocational and technical teacher education: the institutional structures and organization of programmes and their content. Within these two areas a wide variety of programmes, institutions and curricula have been examined. On the basis of the results of the study, no one system may be held up as an ideal or universal model. It is the responsibility of each country and each society to construct that form of teacher education most suitable to its traditions and aspirations.

If there is no one ideal system, nevertheless nations may learn from one another. It has been one of the purposes of this study to provide, through the survey of a large number of programmes, information, ideas and models which may be adapted outside the

country of origin. For, technology is inherently a field which, unlike language and literature for example, knows no national boundaries: the materials used and the language of technology are virtually universal. There remain, however, annoying barriers to the universality of technology—for example, measures, coding systems, and methods of technical drawing. These barriers to the free flow of technical knowledge could, however, be levelled if improvements were made in agreement on international standards. It is possible, then, to establish certain guidelines upon which general agreement concerning technical and vocational teacher education may be reached. The study will have served another of its purposes if it stimulates further thinking on the establishment of such guidelines. In conclusion, then, some of the general trends which have emerged and which may be used as guidelines will be discussed, followed by several recommendations germane to the problems facing developing countries.

At present, there is a clear trend toward four years of post-secondary studies as a prerequisite for technical and vocational teacher qualification on the secondary level if an individual enters a a teacher preparation programme directly after completing secondary education. Under these conditions initial teacher preparation is completed at the first university degree level. This trend is to be encouraged for several reasons. In the first place, it corresponds to the continue raising of the school leaving age. As adolescents are obliged to continue their schooling, teachers are no longer adequately prepared with an upper secondary or immediate post-secondary education. In the second place, the requirement of a lower university level education has long been applied to teachers of general subjects. If vocational and technical teachers are to achieve the same status, they should have achieved the same educational level in both the special field and in pedagogical studies. Furthermore, with the trend to comprehensive schools which include both technical and vocational streams, it is of importance that teachers in these streams have the same status as their colleagues. Thus, integrated teacher preparation programmes which take candidates directly from secondary schools should aim at this level if it is not already achieved.

On the basis of this study, it may be concluded that technical teachers have for the most part reached this desired level of education, although many do not have the necessary practical experience in technician fields. Vocational teachers are less likely, on the whole, to have a university education. On the other hand, they as well as workshop teachers are more likely to have achieved a high level

practical qualification. In most countries, with several notable exceptions, workshop teachers have little if any post-secondary education. This, however, is usually not the case where one individual is responsible for teaching both the theory and the practice of a craft or trade. General technical teachers are as yet for the most part drawn from the ranks of teachers trained in other fields. Because general technical education is often given at the upper primary or lower secondary level, the teachers may not have had a university level education in their field, but rather two to three years' post-secondary studies in a teacher preparation institution.

If the teaching profession is to attract people of good technical qualification and in the necessary numbers, teacher preparation programmes cannot be limited to four-year integrated programmes. It has been argued in this study that flexibility and variety in programmes leading to technical and vocational teacher qualification are necessary if the demands for both quantity and quality are to be filled. Any number of examples of short pedagogical courses for those with the necessary technical qualifications and of in-service courses leading to teacher certification, have been cited. These should exist side by side with the longer integrated programmes, and be given in close co-operation with those institutions offering the longer courses.

A workable and flexible organization of technical and vocational teacher preparation programmes will not alone serve educational needs. The quality of the content of teacher preparation courses will determine the quality of vocational and technical education. It is deemed necessary that all vocational and technical teachers, in order to be prepared adequately for their tasks, must have achieved a rather high level of general education, have both a theoretical and practical mastery of their field, and must have studied the theoretical aspects of teaching as well as have had practical teaching experience under the guidance and close supervision of experienced educators. There are, as we have seen throughout the study, any number of means of achieving this triple aspects of the vocational and technical teacher preparation. Integrated programmes assure all three aspects. Perhaps the most difficult problem facing such programmes is providing for thorough practical experience in the field. It is for this reason that teacher preparation institutions must establish close lines of co-operation with industrial and business enterprises. Where future teachers have already achieved technical qualification and have proved their practical competence in their field, the thrust of the preparation programmes should then be to further the general education and to give an adequate pedagogical preparation.

Often in the past it has been considered unnecessary for a technically competent individual to have had pedagogical preparation. This view is now changing in both the schools and industry and this change is to be encouraged in every way. For to know how to execute a task and to know how to teach the execution of this task are two very different things. Pedagogical preparation must then include fundamental education courses as well as courses in the psychology of the age groups to be taught and a thorough preparation in the methods available for the effective teaching of vocational and technical subjects. These courses should be so designed that the future teacher looks upon his profession as a creative one, and that he does not simply parrot throughout his career certain techniques learned in his initial teacher education courses. It has, furthermore, been argued here that guided practical teaching experience is a necessary and culminating part of any programme of teacher education. Through his practical experience the future teacher may build self-confidence; he may correct weaknesses and errors in his methods of teaching before they become ingrained habits. In order that he may profit by this experience, he must be closely guided and supervised, otherwise the practical teaching stage will have little pedagogical value.

In the past, vocational and technical teachers have not had the same status as teachers of traditional subjects. This must change if teachers dedicated to ideals of excellence are to be attracted to vocational and technical education. A good vocational or technical teacher must have had practical experience in his field, an obligation which lengthens the time necessary for adequate teacher preparation. Furthermore, industry and business offer much more attractive salaries to technically competent personnel. This outside competition does not exist for teachers of academic subjects. Therefore great efforts must be made to raise the salaries and status of technical and vocational teachers, as well as raising the level of teacher preparation.

Teacher education must not be considered ended when initial qualification is achieved. This stage should be seen as simply the first in a career which should include further education. As technology changes ever more rapidly, the technical and vocational teacher must keep abreast of innovations in the theory and practice of his field. Teachers must also be aware of new educational theories, methods and techniques. Thus, if vocational and technical education is to be both effective and creative, responsible authorities should encourage by all means vocational and technical teachers to continue their education.

As was stated in the introduction to this study, it cannot pretend to be complete, given both the extent of the subject and the lack of information. It has become quite clear that there are numerous areas for further research in the field of vocational and technical teacher education. Curriculum research is an obvious example. Yet another is how to prepare competent teacher educators in the field as well as outstanding training officers in industry. And the means must be found to circulate the results of this research so that others will profit by it. Hopefully, this study with its general findings will serve to stimulate such further investigation.

One of the basic purposes of this study has been to describe what is now being done in the field in developing countries as well as to establish a basis for formulating recommendations as to what might be done. In many areas technical and vocational education is of very recent vintage and the facilities for preparing teachers virtually negligible. As we have seen, numerous steps are now being taken to remedy this situation, yet the task remains enormous. It has been recognized that technical and vocational education is a vital prerequisite for economic and social progress, and that if technical education is to be viable, the schools must be staffed with competent and dedicated teachers.

Developing nations may indeed profit by the experience of others and establish systems of technical education relatively rapidly. On the other hand, care must be taken so that examples are not simply copied. If technical education and the preparation of teachers for it is to flourish, it must be adapted in accordance with local traditions and interests.

As has been mentioned several times in the course of this study, one of the greatest problems facing developing countries is not a material one, but a question of values. Jobs requiring technical and vocational education have in the past been viewed as menial and degrading. Thus on the one hand, many have pursued general studies only to find themselves unemployable, and, on the other, large numbers not gifted for academic studies have not had the opportunity to pursue technical and vocational studies. Thus it is to be highly recommended that greater emphasis be given to the establishment of general technical education in the primary and lower secondary schools and therefore to the preparation of general technical teachers. Well-prepared general technical teachers may well be one of the most important means of breaking the impasse created by negative attitudes toward vocational and technical education.

Yet another obstacle to the expansion of teacher education

programmes and thus to technical and vocational education as a whole in developing countries is the lack of key personnel: teacher educators, administrators and supervisors. There is no short cut to the creation of this competent leadership. At present, these key people, few in number, may be trained abroad or at home by international experts. Only with time, when technical and vocational teachers now in training have gained the requisite practical experience in teaching, will the ranks of leadership be expanded thus enabling the system as a whole to flourish.

With the exception of the chapter devoted to the preparation of training-staff within industry, this study has dealt primarily with full-time programmes in educational institutions, either integrated or pedagogical, for the preparation of technical and vocational teachers for the schools. That is, the emphasis has been placed on formal educational structure and content. It should not be forgotten that in developed countries there are innumerable programmes outside the schools for technical and vocational education, and training programmes within industry. Many if not most teachers are drawn from employment. But these programmes and sources of recruitment are not applicable to the great majority of developing countries, where, on the one hand, industry and other employment sectors do not have and cannot afford training facilities, and, on the other hand, the demand for trained personnel is too great for industry, etc. to be a source of teacher recruitment. Thus if progress is to be made which will have widespread and lasting effects, developing countries must begin with the formal education system for both technical and vocational education and the training of teachers.

As a result, the major trend in terms of the structure of technical and vocational teacher preparation in developing countries is to establish special teacher preparation institutions, or departments attached to existing institutions, which serve a pilot purpose. In some developing countries these institutions have become the centre of a larger complex of national stature catering to the needs of many aspects of technical and vocational education, teacher training and research in the field. It would appear that this institutional approach is a sensible and manageable one in the beginning stages of preparing competent teachers to staff vocational and technical education, whether in the general schools or in special institutions. These institutions, which should remain as flexible as possible, may serve as the framework for eventual expansion of technical and vocational teacher education and training.

Technical and vocational teacher education should be a part of a

long-range educational strategy for development. Thus teacher preparation is not simply a question of training the number of teachers necessary to train people in order to meet projected manpower needs. It should rather be seen as an important part of a total and continuous development effort. Creating a long-range educational strategy includes planning for outer and inner reforms, or reforms in both form and content, in accordance with the aspirations, needs and resources of a given country.

Governments are beginning to realize that outer reforms in the education system—general structural organization, investment in more schools and workshop equipment—are useless unless accompanied by inner reforms. These inner reforms include curriculum development and teacher preparation. For, unless there is something of value to teach and competent people to perform this task, educational development will not take place. This is nowhere more true than in technical and vocational education, for often although school facilities exist and students are enrolled, there are not enough qualified teachers to make the education and training provided meaningful.

Technical and vocational teacher education must then be seen in terms of long-range development. For, if an educational reform including the preparation of teachers to execute it is to be thoroughly implemented, from at least ten to sixteen years are required before significant results may be seen. Short-term solutions such as crash programmes or even the creation of one institution are not enough. Interim solutions should be considered as such, and should be so created that they will be useful foundations upon which to build and serve as a step toward attaining higher objectives. For, rapid changes are taking place in both education and technical fields. For example, the present trend everywhere is towards prolongation of compulsory schooling. Technical and vocational education will be expanded accordingly and more teachers will be required. With technological advance, many jobs for both workers and technicians are changing or becoming obsolete and therefore teachers must be able to educate as well as train their students to adapt to change in the course of their careers.

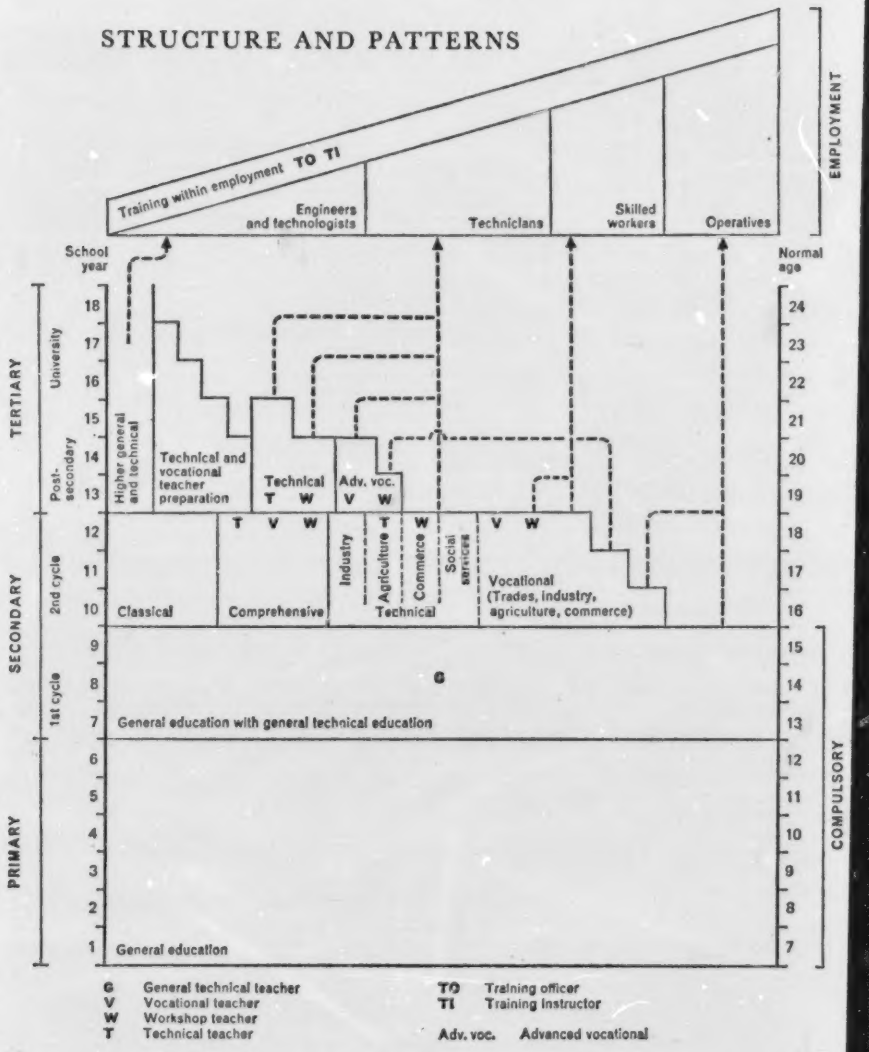
Thus plans for technical and vocational teacher education must take into consideration numerous and complex factors. Each country, each society, must find its own solutions. Nevertheless, on the basis of available information, long-range targets should and can be set. The authorities responsible for technical and vocational teacher education must plan within a broad context or coming decades will find that education insufficient to meet society's needs.

This study has considered some of the elements necessary to the development of technical and vocational teacher education. Certainly not all elements have been discussed in depth—e.g., the co-ordination between the teacher preparation institutions and industry or other sectors of the economy, over-all planning, etc. But what has been discussed are the basic building blocks, which may be cut, hewn and placed according to individual taste and need.

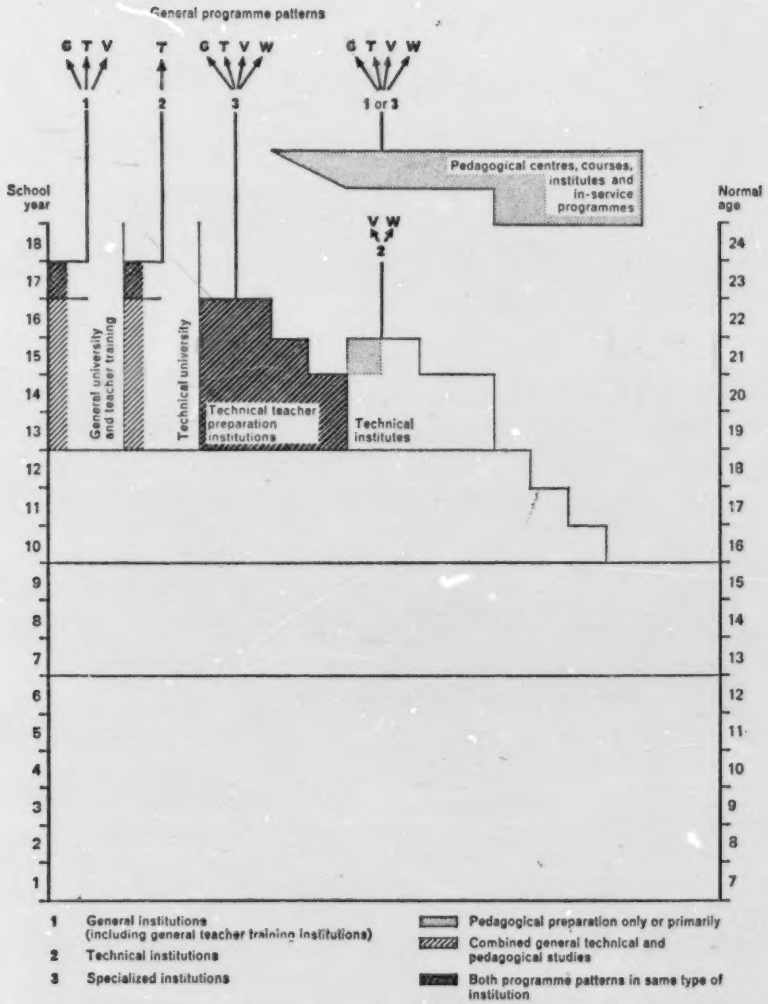
Much has been done in the field of technical and vocational teacher education and much remains to be done, in industrialized as well as developing countries. The challenges are great and much effort is needed to meet them. And they must be met if technology is to advance in the interests of mankind, and social and economic progress achieved.

APPENDIX I

STRUCTURE AND PATTERNS



1. Educational structure model



2. Institutional patterns model for technical and vocational teacher preparation including general programme patterns

APPENDIX II

SPECIMEN CURRICULA FOR GENERAL TECHNICAL TEACHER PREPARATION

1. *Union of Soviet Socialist Republics:* The Industrial Pedagogy Faculty[1]

Subject	Number of periods during five years		
	Lecture	Laboratory	Seminars and practical work
General:			
History of the CPSU	120		100
Political economy	80		70
Dialectical and historical materialism	70		70
Foreign language			140
Basic science and mathematics:			
Higher mathematics	220		190
General physics	160	110	48
General chemistry	64	44	
Descriptive geometry and technical drawing	34	170	
Technical:			
Theoretical mechanics	90	60	
Applied mechanics	180	140	30
Electrical and radio engineering	100	110	
Technology of metals, woods, plastics and other materials	86	44	
Theory of cutting, machine tools and other implements	56	24	

1. S. G. Shapovalenko (ed.), *Polytechnical Education in the U.S.S.R.* (this series IV), pp. 238–239. Paris, Unesco, 1963.

1. *Union of Soviet Socialist Republics (cont.)*

Subject	Number of periods during 5 years		
	Lecture	Laboratory	Seminars and practical work
Practical work in manual and machine processing of metals, woods and other materials		526	
Technology of actual production	70	32	12
Machine operation (inc. engineering)	112	116	12
Practical work in autos, tractors and agricultural machinery and repair	28	176	
Educational cinema and photography		48	
Safety techniques	30		8
Fundamentals of organization and economics of production	36		
Pedagogical:			
General and age group psychology	68		20
Pedagogy	50		50
History of pedagogy	54		18
School hygiene	18		18
Methods of manual and technical instruction and the teaching of technical subjects	50	90	20
Special seminar on pedagogy, psychology or the methods of manual and technical instruction and the teaching of technical subjects			36
Other:			
Physical training			140
Specialized training			48
TOTALS	1 776	1 690	1 030

2. *Nigeria:* National Technical Teachers College, Yaba (Nigerian Certificate in Education (Technical))

Subjects	Hours per year		
	1st year	2nd year	3rd year
General and basic science and mathematics:			
English	72	60	
Social studies	72	30	
Applied science	144	90	
Mathematics	144	90	
Technical:			
Technical drawing	144	120	128
Workshop	360	240	320
Industrial orientation		240	240
Pedagogical:			
Educational philosophy	36	30	32
Educational psychology		30	32
Educational sociology		30	32
Educational method	36	60	64
Applied aids and teaching materials		60	64
Comparative education and history of education			32
Library	36		
Teaching practice		240	120
Other:			
Project work			128
Tutorials, private study, visits, etc.	36	60	96
Physical and health education (first aid)	72	60	64
Special lectures and tutorials	72	60	64

APPENDIX III

SPECIMEN CURRICULA FOR VOCATIONAL AND WORKSHOP TEACHER EDUCATION

1. *Finland:* Vocational Teacher Training Institution, Hameenlinna (Ten Month Programme)

Subjects	Number of lessons	
	Autumn term	Spring term
General:		
Mother tongue:		
A. Written	14	10
B. Oral	14	20
Pedagogical:		
Psychology	25	20
General didactics	30	10
Vocational didactics:		
A. General vocational subjects	21	20
B. Vocational technics	63	10
Teaching practice:		
A. Exercise lessons, criticism and specimens	67	193
B. Exercises in seminars		50
C. Exercises in planning and use of instructional material	14	20
Administration of vocational schools:		
A. Administration of schools	18	10
B. Industrial economics	7	10
School and work hygiene		15
Physical training	7	10
Examinations and handing out of examinations	21	30
Traffic knowledge and road safety	4	
Practice teaching:	Three months between the two terms	

2. *Union of Soviet Socialist Republics:* Industrial Training Technicum (Special field: metal cutting machine tool operation)

Subjects	Total hours per week			
	1st year	2nd year	3rd year	4th year
General subjects in the special technical field:				
Principles of automation			28	36
Economics, management and planning of production			56	63
Technical standards			42	
Accident and fire prevention				36
Pedagogical:				
Psychology	51			
Education		106		
Organization and methods of workshop instruction			156	
Basic Communist ethics				36
Practice teaching and diploma subject:				
Teaching practice		41	41	369
Diploma project				288
Other:				
Physical education	72	12	112	75
Optional:				
Russian language	72	76		
Physical culture	36	30	28	9
Use of technical aids in teaching		30	70	
TOTALS	1 609	1 587	1 585	1 902

3. *Austria:* Federal Institute of Vocational Education

	Weekly class periods	
	Semester	
	1	2
Compulsory subjects:		
Religious instruction (basic questions of religious education and self-education)	1	1
Seminar for religious questions	1	1
Theory of education	2	2
Pedagogical psychology	3	1
Pedagogical sociology	—	2
Seminar on youth and adolescence	2	2
Fundamentals of the history of education, with particular stress on vocational education	2	—
School laws and regulations	2	—
Compulsory subjects of general and professional education:		
German language and speech	5	3
History	2	2
Geography	2	1
Civics	2	—
General law	1	1
Physical education	2	2
Political economy	2	—
Industrial organization	1	3
Industrial management	—	1
Industrial hygiene and accident prevention	—	1
Supplementary professional training	6	6
Compulsory subjects of practical education:		
Methodology and practical schoolwork	—	2
Practice teaching	—	4
	—	—
TOTAL: number of weekly class periods	36	35
Optional subjects:		
Arts	2	2
Modern language	2	2

4. *Tunisia:* The Vocational Instructor Training Institute (Institut National de Formation et de Perfection Professionnelle)

Subject	Phase I 8 months	Phase II 2 months
General:		
Arabic	2	
French	4	
Civics/Labour legislation	2	
(Physical education)	2	
Basic science:		
Arithmetic	2	
Technical: theory and practice:		
Technology	2	
Drawing	4	
Workshop	21	
Pedagogy:		
Practical pedagogy		30
Functional formation		4
Audio-visual techniques		2
Pedagogical and practice:		
Practice teaching		2 weeks
TOTAL	39	36

APPENDIX IV

SPECIMEN CURRICULA FOR TECHNICAL TEACHER EDUCATION

1. *United States of America:* Technical Education Department, Oklahoma State University (Bachelor of Science Degree in Technical Education with emphasis in Engineering Technology)

Subject	Semester hours required
Specialized technical courses	30
Related technical courses	10
Mathematics and science Algebra and trigonometry Analytic geometry Calculus Calculus and differential equations Selected courses in science	26
Engineering science Upper division—selected and approved	14
Social science American history American government	6
Humanities Western culture or courses from art, drama, literature, music or philosophy	4
Communications Freshman composition Introduction to public speaking	9

continued on page 222

2. *Singapore:* Programme for Technical Teacher's Education

Course outline

1. EDUCATION (PEDAGOGICS)	192				
1.1 Educational and industrial psychology		72			
1.2 Study techniques		12			
1.3 Educational and industrial sociology		36			
1.4 Principles of education		72			
2. EDUCATIONAL METHODS	408				
2.1 Teaching methods		72			
2.2 Special methods and technology		180			
2.3 Methods of teaching special subjects		108			
2.4 Library methods		12			
2.5 School administration		36			
3. TEACHING AIDS	348				
3.1 Audio-visual aids		144[1]			
3.2 Scheme production		204			
4. RESEARCH WORK	420				
4.1 Educational technology		60			
4.2 Research project		360			
5. TEACHING PRACTICE	950				
5.1 Attending classes as an observer		10[2] + 180[2]			
5.2 Training lessons (theory)		20[2]			
5.3 Training lessons (practice)		20[2]			
5.4 Teaching practice		720[3,4]			
			HSC	Polytech	C & G
6. GENERAL SUBJECTS			264	300	408
6.1 Technical English and oral expression			72	72	72
6.2 Mathematics			36	72	108
6.3 Engineering science			36	72	108
6.4 Technical drawing			72	36	72
6.5 Physical education			48	48	48
7. INDUSTRIAL ORIENTATION	348				
7.1 Industrial orientation		264			
7.2 Visits to industrial enterprises		36			
7.3 First aid		24			
7.4 Safety		24			
			HSC	Polytech	C & G
8. FURTHER RELATED SHOP			402	366	258
8.1 Supplementary work—content skill			330	294	186
8.2 Related workshop theory			72	72	72
9. OPTIONAL SUBJECTS					
9.1 Optional (e.g. national language)					
9.2 Extra-curricular activities					

1. Production of aids; 72 hours with class divided into groups of 10.
2. The class divided into groups of 10.
3. For each trainee during the period.

1st year				2nd year				3rd year			
1st Semester		2nd Semester		1st Semester		2nd Semester		1st Semester		2nd Semester	
12 weeks	6 weeks	12 weeks	6 weeks	12 weeks	6 weeks	12 weeks	6 weeks	12 weeks	6 weeks	12 weeks	6 weeks
2 1 3		2 1 2					2 2 2				2 2
3 5 3 1		3 5 3					5 3 2		5 3 2		2
3 4		3 4					4 4		4 7		4 7
								5 25	5		5
5^2 1^5 1^5		5^2 1^5 1^6	90^3 90^3			90^3 270^3				360^3	
2 1	2|2|2 2|4|4 4|2|2	2 2|0|0 0|2|0 0|0|2 1		0|5|8 2|2|7 4|2|3 1			2 1		2 1		
	3 2 2				6 × 44		3 2 2				
	15|15|15 4			20|17|8 4							
30	30	30	30	35	44	30	34	30	29	30	22

4. Approximately 20 per cent of hours under special supervision from TTC.
5. For each trainee; the class divided into groups of 10.

1. *United States of America (contd.)*

Subject	Semester hours required
Technical education	13
Introduction to technical education	
Methods of teaching	
Analysis techniques	
Instructional aids	
Technical education programme planning	
Special problems	
Electives	14
Upper division, selected and approved	
Suggested:	
Human relations in industry	
Psychology—business and industrial	
Educational psychology	
Report writing	
Courses required for certification as high school teacher	
Student teaching	
Biological science	
Educational psychology	
Oklahoma history	

APPENDIX V

SAMPLE COURSE SYLLABI

1. *France:* Pedagogical Syllabus, ENSSAA

I. *Elements of psychology and sociology*
Methods of psychology
Psychology of behaviour—the notion of apprenticeship
Methods of tests
Psychoanalysis and the unconscious
Cultural psychology—relation of psychology and sociology
Gestalt psychology and structuralist psychology
The characterological school
Notions of general psychological functions (perception, imagination, memory, language, etc.).

Adolescent psychology
- Pedagogical consequences
- The adolescent in the rural situation; his education
- Necessity for a specifically agricultural education.

Notions of sociology
- Basic concepts (opinion-attitudes, position, role, norms, etc.)
- Sociology of the village.

Practical work
- Example of psychological test
- Study of a case of psychological blocks to change
- Inquiry into rural communes and the establishment of a scale of attitudes regarding:
  - departure from the rural milieu
  - rural migration
  - the agricultural technician.

II. *Basic notions of pedagogy*

History and theories of education
In-depth study of great education systems

Educational institutions
Pedagogy of rural development.

Practical work
Audio-visual methods—documentation: techniques and principles of utilization
Role of manuals
Control of knowledge and aptitudes—organization of examinations, docimology, grades and exercises, the examiners and the role of subjectivity.

Agricultural education
Intellectual investment in agriculture.

Practical work
Determination of the need for intellectual investment
Academic and vocational orientation in agricultural education
Structures of agricultural education, historical and actual.

Comparative agricultural education
Study of systems of agricultural vocational education
An essay on comparative pedagogy—nature of the comparison
Echelons and degrees of comparison.

Technical co-operation and agricultural education
Need for technical co-operation in the domaine of secondary and higher agricultural education, in accelerated vocational education and in agricultural popularization
Presentation of concrete cases.

III. *Pedagogical application*

Pedagogical exercises at ENSSAA: within each option of specialization the student under the direction of professors of pedagogy learns:

to make a bibliography
to make an oral presentation
to organize and guide a seminar
to lead a meeting
to compose technical documents
to prepare and guide visits.

A critical study of the programmes and methods of agricultural education: qualitative and quantitative problems, study of the respective proportion of various disciplines, scheduling.

Pedagogy particular to each discipline: economics, agriculture, animal production

Practice teaching in an agricultural *lycée*—six weeks

Organization and functioning of the establishment

Buildings and equipment for: theoretical teaching, practical work, documentation, sports and social and cultural activities

Exterior relations: former students, teachers activities outside the *lycée*, liaisons with the community.

Students: problems of the boarding school, discipline and leisure, study of a class, level of recruitment, social and geographical origins, their future.

Teaching practice.

2. *Singapore:* Technical Teachers Training College

PRINCIPLES OF EDUCATION

Objectives

1. To afford a general view of pedagogics and the role which systematic pedagogics plays in practical education work.
2. To give the trainee more thorough knowledge concerning the significance of the pedagogics and the education work done by him.
3. To offer a view of the education's function in the development of the individual and its function in the society.
4. To give an orientation of the growth of the Singaporean school system.
5. To give details concerning the teacher's formal and informal roles, with particular reference to his responsibilities in a changing society.

Duration of course

The course consists of 72 hours, divided into 12 three-hour sessions in the first term, 12 two-hour sessions in the second term, and 6 two-hour sessions in the sixth term.

MAIN PARTS

I. *Objectives*

School in a changing society

The educational welfare state

Review of education in Singapore, 1819 to the present

Objectives in the Singapore Education System

Brief survey of contemporary education in other countries

Education in the international setting

Training of the physically and mentally handicapped

Re-education

II. *Curriculum*

Determining the objectives
The making of an inventory
Joint planning
Analysis work
The objectives, content and organization of syllabus
Textbooks
Co-ordination of subjects and teachers

III. *Principles of teaching*

To convey knowledge and understanding
Basic requirements of instruction
Review of means of information
The differences between teaching adolescents and adults
Special considerations for adults
Correlation of theory and practice
Teacher's tasks
Inter-action:
  teacher—student
  student—student
  teacher—teacher
  teacher—parents
Individualizing
Programmed learning
Group work: sociometry
Working up lectures
Conceptions:
  design of lesson
  principles of lesson
  phases of lesson
Active chairmanship (conference technique)

IV. *The student and the educational environment*

Background and expectation of the student
The time factor
The social environment
The process of adaptation: adaptation problems
Observations and analysis of the students
Interviews: developmental talks

V. *Analysis of results*

Evaluation methods
Systematized techniques for student observation
Subjective and informal observations of the students
The purpose of student grading
Absolute and relative grading
Other methods of evaluating students' abilities
Educational statistics

3. *United States of America:* The Ohio State University

Trade and Industrial Education, Syllabus for course designed to provide basic teaching methods and techniques, vocational course organization and vocational class management

The objectives of the 18-hour sequence of Education 575 is to develop within an already competent skilled or technical worker, the competencies essential to effective teaching of his particular vocation. More specifically, this course is intended to develop the following knowledge and competencies:

1. A knowledge of public education and vocational education
2. The place and purpose of vocational education in public secondary education
3. The teaching methods and techniques in vocational and trade and industrial education
4. How to analyse an occupation for instructional content
5. The building of a course of study
6. The sources and use of instructional materials
7. How to organize and manage vocational shops and laboratories
8. Appraisal of student achievement.

COURSE OUTLINE

Introduction to Vocational Trade and Industrial Teaching

Planning your work as an inspector
The teaching steps
Teaching and working relationships
Planning for your teaching
Planning for your classes
The nature of vocational teaching
Selecting and organizing teaching content
Planning and preparing for a lesson
Presenting the lesson
Helping learner to develop skill
Helping learner to acquire information
Evaluating learner progress
Providing for individual difference
Understanding the learner.

Teaching Methods and Techniques in Trade and Industrial Education

How to use oral questions
The art of questioning
Using questions in manipulative and technology classes
Introducing a lesson
Studying—outlining
Supervising study

Evaluating lessons
The group discussion
The conference method
Round table and panel discussions
The education field trip
The manipulative demonstration.

Introduction to Occupational Analysis

Identifying operations or processes
Operations, details and application
Technology information unit
Blocking the occupation
Arranging the elements
Service and custom occupations
Analysing the operation
Listing the instructional steps.

4. *Nigeria:* National Technical Teachers College

Nigerian Certificate of Education (Commercial) Syllabus for Special Methods Course

Objectives

1. To provide an opportunity in which the student can study and practice the teaching of the subjects of his choice.
2. To study aspects of organization, curricula development, syllabus preparation, and evaluation in particular types of courses, with the aim of establishing orderly and sequential presentation of subject matter.
3. To study organization of special classrooms, offices, and the equipment used therein.

Close collaboration with 'subject tutors' and audio-visual aids is essential.

The undermentioned topics should be considered in relation to the major subject area of the student.

Introduction

Commercial education, meaning aim and scope.
Development and present status; relationship with general education.
Commercial education in junior and senior classes of secondary schools and post-secondary institutions.
Socio-economic background of commercial education in Nigeria.
Purpose of special method. Practice talks on topics of interest.
Discussion on subject matter. Observation of demonstration lesson.

The teacher of commercial subjects

His work and qualifications; his problems; opportunities and professional activities; professional organizations and his participation. Administration and supervision of commercial education. Extra-curricular activities—clubs, sports, etc.

Implementing programme of commercial subjects

Subjects, and division into distributive, secretarial, and book-keeping, curricula. Syllabus, scheme of work. Lesson planning; main and related subjects, non-commercial subjects. Selection of textbooks. Teaching procedures. Selection and maintenance of equipment; basis for selection; securing modern equipment; inventory. Methods of treating the different aspects of subject matter.

Evaluation

Meaning and purpose. Assessment of skills. Progressive assessment. Examinations; types, form of questions, marking; standardization and evaluation.

Demonstration lessons

Searching for lesson materials; lesson preparation, materials and aids. Delivery of lessons. Discussion and appraisal. Micro-teaching.

Programmed instruction and research vocational guidance

Principles; study of programmes applicable to special subject. Subject expansion. Methods of research. Meaning and need. Principles and types. Teacher's responsibility.

5. *United Kingdom:* Huddersfield College of Education (Technical)

Topics dealt with in development in adolescence[1]

1. Development in adolescence: intellectual, physical, emotional, social; the learning process: individual differences: influences on development: the craft apprentice: the technician apprentice: technologist student: the young semi-skilled and unskilled operatives: the normal adolescent apprentice: discussion studies of abnormal adolescents.
2. Heredity and environment in the development of adolescent students; the importance of home, school, college, working environments, parents, teachers, other adults in their lives.
3. Social and occupational structure of society and industry and their influence on adolescent education and careers.

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4. Development of attitudes: growth and pattern of vocational, social and personal interests, ideals, standards, values, ambitions, personality growth, changing roles, emanicipation.
5. Constructing, interpreting, using sociograms; inventories; group techniques in studying adolescents.
6. Final years at school and transferring from school and adjustment to work and further education.
7. The Youth Service and other agencies concerned with young people.
8. Problems of social adjustment.
9. Delinquent and problem adolescents.
10. The literature of physical and social maturation and sex education for family living.

6. *Tunisia:* National Institute for Vocational Training and Upgrading, Rades

Syllabus—Audio-Visual Teaching Techniques Instructor Training Programme

Theory

1. Goals of audio-visual methods
2. Synthesis of audio-visual methods
3. Classification of audio-visual methods

Audio-visual aids

1. Non-projected aids:
   Blackboard
   Feltboard
   Posters
   Models
   Photographs
2. Projected aids:
   Fixed projection
   Slide projection
   Film strips
3. Auditory aids:
   Records
   Tape recorders
4. Audio-visual aids:
   Films
   Television
5. Conceptions:
   Concepts of visual aids
   Concepts of audio-visual aids

Practice with audio-visual aids

1. Creation and concentration of figures for a feltboard
2. Manipulation and upkeep of a projector—Riviere 300
3. The tape recorder: recording and playing
4. Practice in using cut-outs, slides and silent films
5. Projection of, and commentary on, 16 mm film
6. Pedagogical methods of using films.

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Questionnaire on vocational and technical education and training sent in May 1968 and replies, filed by country in twelve volumes.

Volume I

Australia
Austria
Belgium
Brazil
Canada
Chile
Colombia
Congo
Cuba
Czechoslovakia
Denmark
Finland
France
German Democratic Republic
Germany, Federal Republic of
India
Ireland

Volume II

Israel
Italy
Japan
Malaysia
Mexico
Morocco
Netherlands
New Zealand
Norway
Poland
Spain
Sweden
Switzerland
Tunisia
Ukrainian S.S.R.
U.S.S.R.
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United Kingdom
United States of America
Yugoslavia

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LIST OF ORGANIZATIONS

Berufspadagogische Institute (Austria)
Bolton College of Education (United Kingdom)
Central Training Council (United Kingdom)
Central Training Institutes (India)
CFPTA—Centres de Formation de Professeurs Techniques Adjoints (France)
CINTERFOR—Inter-American Centre for Advanced Technical and Vocational Training (Italy)
College of Industrial Pedagogy (Yugoslavia)
Colleges of Education (Technical) (United Kingdom)
Coombe Lodge (Further Education Staff College) (United Kingdom)
Council of Europe, Committee for General and Technical Education
CTESA—Comparative Technical Education Seminar Abroad
Ecole des Arts et Métiers (Lebanon)
Ecole Normale Supérieure (France)
Ecoles Normales Techniques Moyennes (Belgium)
Economic Council of the Iron and Steel Industry (Germany, Federal Republic of)
Electro-Mechanical Training Centre (Singapore)
Employment Promotion Projects Corporation (Japan)
Engineering Industries Development Agency (Singapore)
ENNA—Écoles Normales Nationales d'Apprentissage (France)
ENNEP—Écoles Normales Nationales de l'Enseignement Professionnel (France)
ENSET—École Normale Supérieure de l'Enseignement Technique (France)
ENSSAA—Ecole Nationale Supérieure des Sciences Agronomique Appliquées (France)
Ford Foundation (United States)
Garnett College of Education (United Kingdom)
Harvard Business School (United States)
Haute École de Commerce (France)
Higher Teacher Training College (Yugoslavia)
Huddersfield College of Education (United Kingdom)
IBRD—International Bank for Reconstruction and Development
ILO—International Labour Organisation
INFI—National Institute for Instructor Training (Peru)
INFPCEA—Institut de Formation des Professeurs Certifiés de l'Enseignement Agricole (France)
International Centre for Advanced Technical and Vocational Training (Italy)
Institute for Vocational Training (Japan)

Institute of Vocational Pedagogics (Sweden)
IPNET—Institut Pedagogique National de l'Enseignement Technique (Lebanon)
KATE—(Greece)
King Mongkut's Institute of Technology in Thailand (Thailand)
The Men's Technical Training College (Turkey)
The National In-Service Training Institute for Vocational and Technical Teachers (U.S.S.R.)
National Technical Teachers Training College (Lagos)
Oklahoma State University (United States)
Rutgers University (State University of New Jersey) (United States)
Santa Barbara College (University of California) (United States)
The Schools Council (United Kingdom)
SELETE (Greece)
SENAI—Industrial Apprenticeship Swevice (Brazil)
SENATI—Servicio Nacional de Aprendizaje y Trabajo Industrial (Peru)
SEVPEN—(France)
Singapore Polytechnical Institute (Singapore)
State Technical University (Chile)
State University College, Oswego, New York (United States)
Technical Department, Teacher Training College, Singapore (Singapore)
The Technical Institute of Education in Chile (Chile)
TECHNION—Institute of Technology (Israel)
Technion Research and Development Foundation (Israel)
Thai-German Institute of Technology (Thailand)
Thai-Japanese Institute of Technology (Thailand)
Thonburi Technical Institute (Thailand)
UNDP—United Nations Development Programme
Unesco—United Nations Educational, Scientific and Cultural Organization
Unicef—United Nations Children's Fund
University of Prague (Poland)
University of Tel-Aviv (Israel)
University of Zurich (Switzerland)
USAID—United States Agency for International Development (United States)
Vocational Instructor Training Institute (Egypt)
Vocational Training Institute (Japan)
Wolverhampton College of Education (United Kingdom)
Yaba Trade Training Centre (Nigeria)

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